In This Issue—*Importance of the Trouble Shooter*

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MOTOR AGE

Volume XLII
Number 20

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CHICAGO, NOVEMBER 16, 1922

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MOTOR AGE

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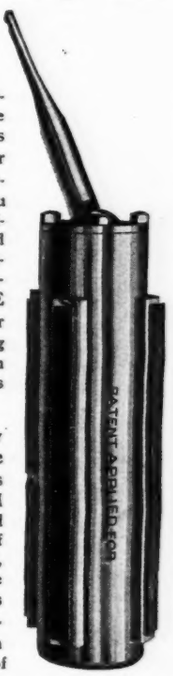

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Vol. XLII, No. 20 Chicago, November 16, 1922 $3 Per Year

MOTOR AGE

Correct Diagnosis Big Factor in Making Maintenance Pay

Good TROUBLE SHOOTERS Are "Rare Birds." Lack of Understanding Fundamentals Often Causes Guesswork and Loss

By B. M. IKERT

ASK most any service manager what his greatest trouble is and nine times out of ten he will answer, "Getting a good trouble shooter."

This in spite of the fact that volumes have been written on "How to locate engine troubles" and in the face of all that has been learned from past experience by the maintenance industry in general.

It is more or less common to hear a car owner condemn the maintenance station and "those garage fellows," on the grounds that they simply guess at what's wrong with an engine and then "stick you for a big repair bill." In many cases there is justification for complaint. To-wit:

A car owner had trouble in that he could not make his engine idle. It was difficult to shift the gears because the engine would turn over too fast to permit of a proper and quiet shift.

His first move was to take the car to a maintenance station in his home town, a small town. The mechanics there told him no doubt he needed a new carbureter, as there seemed nothing gained by changing the carbureter adjustment. Well, the owner said the engine had idled all right before, so why

should a new carbureter be necessary all of a sudden? The mechanics answered that they had found many cases like this before on this particular car, that it was characteristic of the carbureter, "can't make her idle on that carbureter" and a similar line of talk.

The owner was a pretty good business man and was skeptical of their diagnosis. So he took the car to Chicago, to a large maintenance station operated by a dealer who sold the same make of car.

Here they told him the trouble was in the ignition or valve timing. "But," said the car owner, "the engine has not been taken apart and seems to run all right when I get going. It's only when I start in low gear, or make the other shifts that I have trouble." Well, he did not get far with that place and left a bit disgruntled.

A friend told him of two young fellows who formerly had worked in the factory which built the car and who had now gained quite a reputation as expert maintenance men on that car. They had a small shop up on the north side, sold no cars, but did take pride in their ability to do good repair and maintenance work. So, the man with the car whose engine would not throttle down, took it there. He did not tell them that two other shops had diagnosed the trouble, but merely said, "The engine won't idle."

One of the young mechanics operated the foot and hand throttle levers. Then he manipulated the spark lever a little bit. "That's easy," he said. He got a screwdriver and pair of pliers and in about 3 minutes the engine idled as well as ever. The butterfly valve and stem had slipped and although the throttle seemed to be closing when the throttle stop screw struck the little lug on the carbureter casting, in reality the butterfly valve still remained open enough to allow the engine to run too fast.

Do you blame the car owner for swearing by these two young mechanics and at the two other shops? As the car owner put it, "Believe me, I am going to take my car to these fellows after this. They **know** what's wrong, when you have trouble. The other fellows guess.

That's one instance of where it paid to be a good trouble shooter. Here's another:

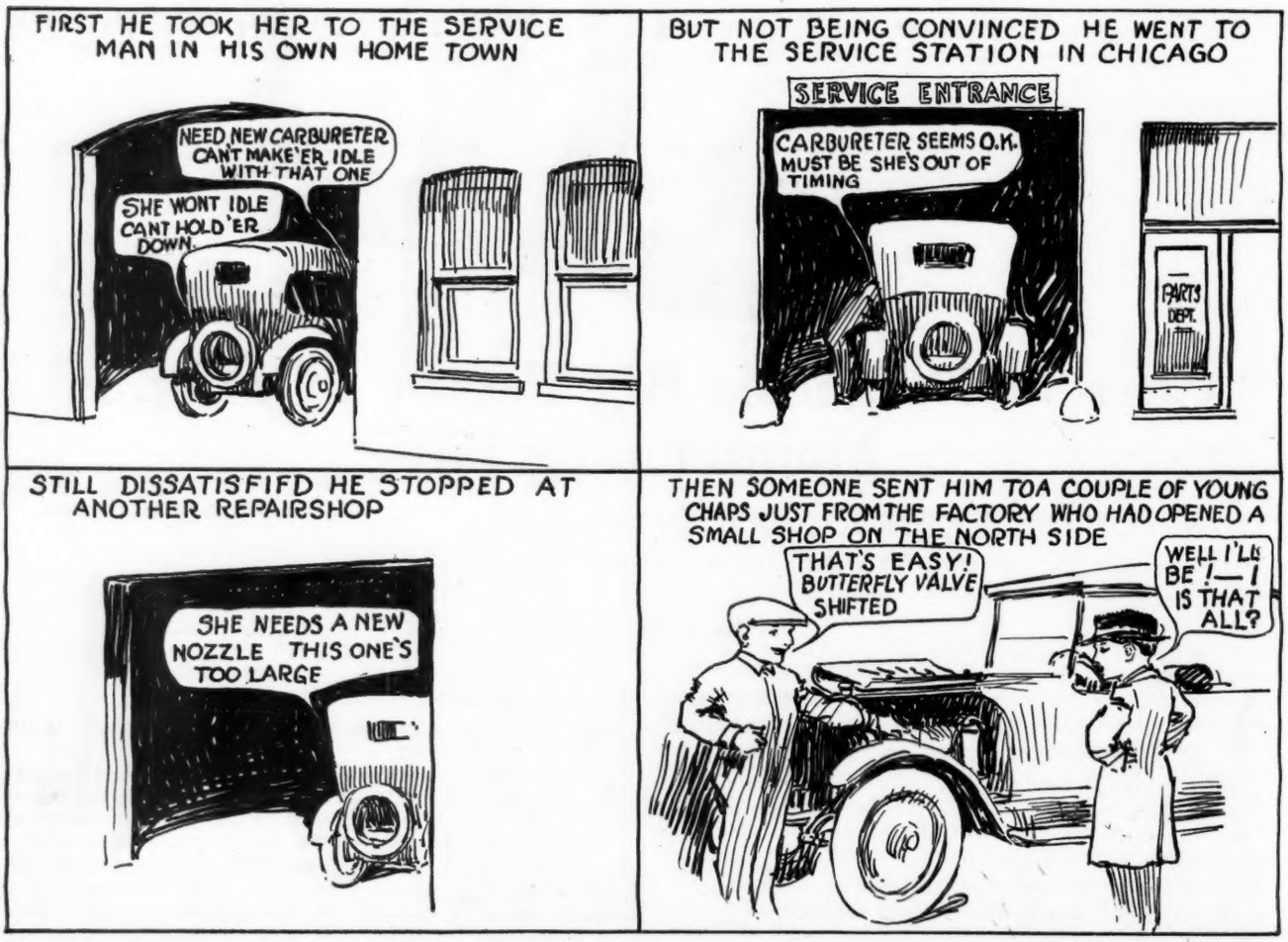
A car owner complained to one maintenance man that his engine "galloped" as though it were getting too rich a mixture. He said the carbureter seemed to drip considerably, the engine ran very jerkily at low speeds but seemed to act fairly well at high speeds.

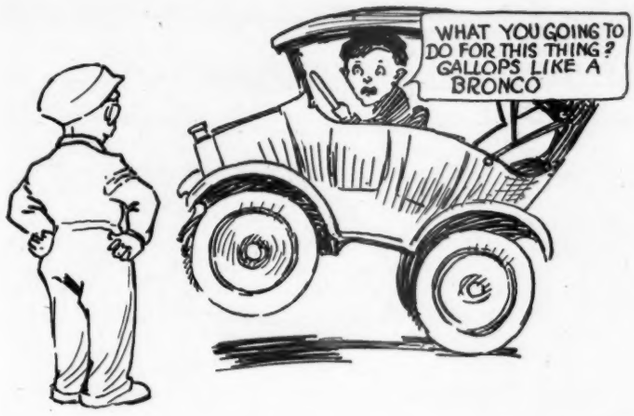
The maintenance man said no doubt the float level was too high in the carbureter, or that the carbureter ought to be fitted with a different sized jet. He worked around for awhile with the float mechanism, but did not get very far toward making the engine perform any better. He finally closed the affair by suggesting to the car owner that a new carburetor might make a difference.

But the car owner was not altogether satisfied with this diagnosis of his trouble, so he took the car to another shop which boasted of "expert mechanics." These men said the difficulty was not in the carbureter, but in the ignition system. The fact that gasoline was dripping from the carbureter at times, they said, showed conclusively that the charges were not all being fired in the cylinders. What the man needed was a new coil on his car. Anyway, the trouble was in the electric system, they said.

When the car owner got this information he recalled that there was in the town a maintenance station which was devoted exclusively to work on the electric systems of cars. They were starting, lighting and ignition experts. He took the car there because by this time he was becoming quite interested in the various interpretations of the engine's strange behaviour.

Now, it so happened that this starting, lighting and ignition station had a fellow in its employ who knew pretty much


FIRST HE TOOK HER TO THE SERVICE MAN IN HIS OWN HOME TOWN
NEED NEW CARBURETER CAN'T MAKE 'ER IDLE WITH THAT ONE
SHE WONT IDLE CANT HOLD 'ER DOWN
BUT NOT BEING CONVINCED HE WENT TO THE SERVICE STATION IN CHICAGO
SERVICE ENTRANCE
CARBURETER SEEMS O.K. MUST BE SHE'S OUT OF TIMING
PARTS DEPT.
STILL DISSATISFIED HE STOPPED AT ANOTHER REPAIRSHOP
SHE NEEDS A NEW NOZZLE THIS ONE'S TOO LARGE
THEN SOMEONE SENT HIM TOA COUPLE OF YOUNG CHAPS JUST FROMTHE FACTORY WHO HADOPENED A SMALL SHOP ON THE NORTH SIDE
THAT'S EASY! BUTTERFLY VALVE SHIFTED
WELL I'LL BE!—IS THAT ALL?



about engines in general. He knew how to tell ignition trouble from carburetion trouble. Hardly had the car owner driven into the place, when this young fellow stepped over and asked, "What's the matter, vacuum tank not working?"

Of course, the car owner was somewhat surprised to hear this because he had about made up his mind to hear the man say he needed a new generator, coil, plugs and half a dozen other things which this maintenance station was ready to sell.

The young trouble shooter, however, was very much on the job and after lifting the hood, disconnected the suction pipe. Then he asked the car owner to start up the engine while he closed the end of the pipe he had disconnected with his finger. The engine started all right and in a few seconds purred like a contented kitten.

"See," said the trouble shooter, "she was sucking raw fuel from the tank right into the manifold."

The remedy was obvious and does not enter into the discussion in this case. The point was, the young trouble shooter instantly recognized what was wrong and proved his point immediately to the owner.

"Then I don't need a new carbureter or coil?" asked the owner of the car.

The maintenance man just smiled, and so did the car owner when he left because he had found a place in which he could have faith.

Many of the larger maintenance stations have one or two men whose sole duty it is to shoot trouble on customers' cars. Usually these men know the particular make of car so well that it becomes a sort of second nature to them to trace a foreign knock in the engine or a rattle in the chassis.

Sometimes, these men have come out of the shop, are good mechanics themselves and, therefore, have a pretty good background on which to work.

Where only one make of car is handled it becomes a relatively easier job for a man to become a good trouble shooter than where he has to work on all makes of cars. Certain cars and engines have certain characteristics and the longer a man works on a car the better acquainted he gets with it.

Thus we often hear such expressions as, "John is a good man to work on Knight engines," or "Bill is the best Buick man around this part of the country," and "if you want a Studebaker tuned right, let Mike do it."

In the smaller towns the trouble shooter often has to play also the role of foreman or mechanic. He has to work on many makes of cars, as a general thing, and therefore must come into contact with all sorts of troubles. **The most important thing for the trouble shooter to bear in mind is that he must master the fundamental principles underlying the causes of certain trouble.** If he understands the principles of timing thoroughly, he will have little difficulty in telling immediately if an engine is out of time. He will not mistake it for anything else.

For instance, one mechanic who had to play the part of trouble shooter also, went wrong the other day on a simple case of timing, which the car owner, who happened to be a good automobile engine man, found himself.

The man had driven his car into the shop to have the ignition checked and also to have the valve stems limbered up with kerosene. One or two valves had been sticking, so the man suggested the mechanic squirt some kerosene on the stems. The mechanic had previously dressed up the ignition points and after the kerosene had been applied to the stems of the valves, the engine was started.

There was a sputtering and spitting back of the exhaust, anything but pleasing to the ears. The mechanic said that was the kerosene in the cylinders. He said, "She'll soon smooth out when the kerosene all gets burned up." But she didn't smooth out, even after a couple of minutes' running.

To the trained ear of the car owner it sounded exactly like an engine way out of time. The explosions in the exhaust pipe and the backfires in the carbureter indicated this clearly. Yet the mechanic kept saying, "She'll soon smooth out."

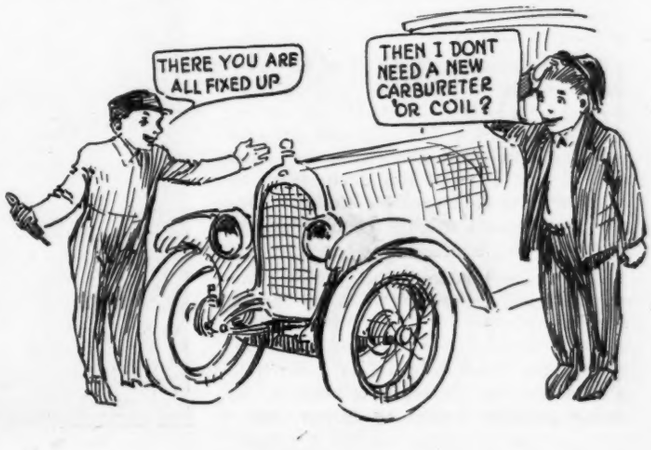
The car owner finally shut off the engine and said, "Let's take a look at the points."

They did, and there was the trouble as plain as day. The mechanic had not slipped the little flat spring around the anchor post on the distributer, with the result that there was little or no tension on the spring. Thus the points were making and breaking contact without any definite relation to firing sequence in the cylinders. That accounted for the erratic firing of the engine.

Yet the mechanic did not tumble to this fact when the engine was started. Anyone familiar with engines knows that a little kerosene squirted onto the valve stems will not seriously affect the running of the engine.

The good trouble shooter must know far more, however, than merely the mechanical and electrical units of a car. He must be a good mixer and diplomatic, he must understand organization spirit and he must be able to talk intelligently with the highest type of customer.

The trouble shooter usually is one of the first men the car owner encounters upon his arrival at the service station. The customer's opinion of the place will largely be formed by his treatment at the hands of the trouble shooter. So often the trouble shooter, or "contact man" as many call him, is a good mechanic and fairly good at locating troubles, but falls down when it comes to dealing with customers. Dis-



courtesy and uncouthness on the part of the trouble shooter will very often incur a customer's dislike for the whole organization. The ideal combination of diplomat, trouble shooter and mechanic is, indeed, a difficult one to find.

The trouble shooter must bear in mind one important thing in all his work and that is that the customer who drives to his maintenance station to begin with, is in trouble. That is, he drives to the station because something is troubling him. Seldom does a customer come bouncing into the place ready to throw his arms about the service manager or trouble shooter out of sheer enthusiasm about his car. Customers don't come in to tell you how fine the engine is working; when everything is all right they stay away.

A service manager said the other day that in his estimation 90 per cent of the troubles their place of business had had with customers could have been eliminated by the right sort of contact man, or trouble shooter.

It stands to reason that a customer is far more apt to open up his heart to the trouble shooter when received with courtesy and consideration and to tell him in detail about his troubles. Very often the ability to get a customer to talk freely about the trouble will reveal certain things that make it easier for the trouble shooter to diagnose the immediate thing in question.

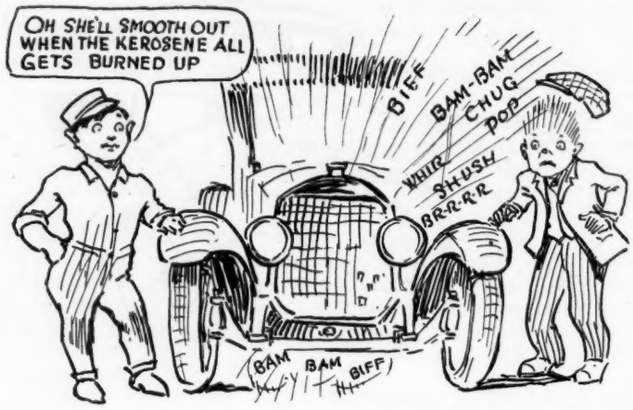
The trouble shooter's work corresponds in a measure to that of the physician, when it comes to getting the history of the case. A doctor always tries, as much as possible, to get information that will be of help in diagnosing a case.

In the same way the more a trouble shooter can find about the history of a car or engine, the way it has been handled, the driver's characteristics and similar things, the better able he is to locate the trouble and apply the remedy.

In the past there have been too many trouble shooters who have talked like this:

"Well, there comes that pest again. He was in the other day and kicked. Nothing suits him. You can't get anywhere with 'em." And so on.

Now the chances are that customer was all right. Like thousands of other people who buy and drive cars, this man probably did not know a thing about the mechanical structure of his car. He wanted it to run well, be comfortable and furnish his transportation. Maybe he was a little finicky about certain things, but that was something for the trouble shooter



to put down in his note book when he was applying the remedies for troubles. It was not something to be used for building up resistance toward the institution on the part of the customer. **A big part of the trouble shooter's job is that of finding out customers' whims and characteristics. Doing so makes his job much easier and adds to the welfare of the whole organization.**

A service manager said, "Give me a man who can meet the public properly and I can make a good trouble shooter out of him if he knows anything about cars at all." This same man went on to state that the public likes to be petted and a man who can do this, and at the same time hold the customer's respect for the maintenance station, is far more apt to get at the seat of trouble a customer might be having, and at the same time make it possible for the organization to satisfy such a customer, than the man who goes about his work feeling that customers have no business coming to the maintenance station and dumping all their grouches on the poor trouble shooter.

It all goes back to some of the things we have repeatedly said in MOTOR AGE, that it's the man always who can make or break a future sale of a car to a customer. The organization may be ever so big, but the wrong kind of contact man will soon manifest itself in various ways.

A Woman But a Real Accessory "Salesman"

"BULBS, piston rings, tires and oil are enough to make a good living for anyone," says Mrs. D. Taylor, who is the live wire of McCreery & Taylor, automobiles and accessories—with the accent on accessories—Albia, Ia.

"That," continued Mrs. Taylor, "is because there is a quick turnover in such articles. Why, I sold 1018 piston rings during the month of September, and my bulb sales run between 200 and 300 a month. I have a big tire business, too.

"I find the accessory end of the automotive business one well adapted for a woman. I can't say so much for selling cars—a woman is not qualified for such work and the average woman would better let that part of the business alone, delegating the car selling to men. But she can make a mighty good living out of the sale of accessories.

"When my husband died a few years ago and when the war demand for his horses put my father out of his livery business, it was necessary for us to look around for something to do. The firm of McCreery & Taylor was formed, the senior member being my father, and I

immediately began developing the automobile accessory business here. We also sell the Olds and Durant cars, a department looked after by my father with the assistance of one combination mechanic and salesman. My own time is taken up exclusively with accessories and office work.

"I began by circularizing all of the surrounding small towns and by specializing upon those accessories which have, as I said before, a quick turnover. Now I am looked upon as a sort of distributor for many of these things in my vicinity.

"I don't stock nor try to sell any but standard and advertised goods. There is the least sales resistance in disposing of such standard items because they all are advertised extensively and are well known.

"In popularizing my tires I have used my little daughter in an advertising stunt, having her photographed with a tire. I use reproductions of these photographs in my advertising literature and find it makes a hit. Yes, I'm well satisfied with my business, as I think I have demonstrated how a woman can employ her talents successfully in the automotive business."

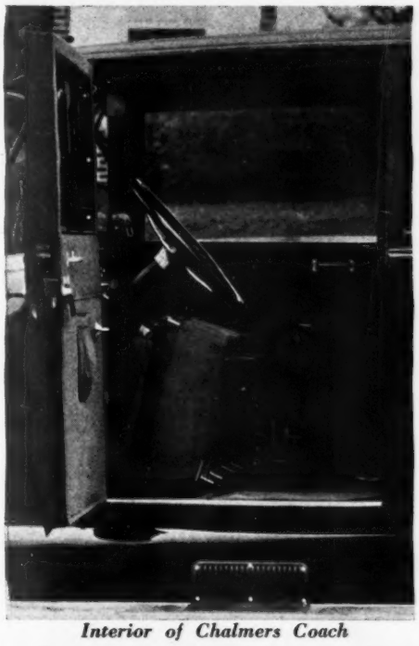
New Models Offered by Chalmers and Davis

Chalmers Has New Coach

THE Chalmers six coach just put on the market is a five-passenger enclosed car of the composite type, built on the standard Chalmers chassis and listing at $1585.

Distinctive features in design are found in the unusual width of the body, the broad doors, the front seats which fold and then tip forward—the driver's chair completely clearing the steering wheel and wide windows all around offering clear view for all passengers.

The body is maroon with black superstructure. A carmine stripe on maroon runs around the body several inches below the belt. Black disk wheels with maroon trimming add to the striking appearance. Special attention has been given the substantial fabric covering of the rear and rear side panels. Seams are eliminated by running fabric cut in one piece from side-window to the opposite side-window.



Interior of Chalmers Coach

The roof, which is also fabric covered, is sloped at an angle to harmonize with the slope of the hood. The interior trim is in broadcloth with hardware of satin finish. The door-window lifters are of the lever type, raising or lowering the windows with less than a half turn. Rear quarter windows are operated by a strap arrangement. There is a roller curtain for the rear light.

A large trunk is mounted on a nickeled trunk rack at the rear. For this a dust cover is also supplied. Wood trunk bars of natural finish protect the body. Additional equipment includes parking lights, windshield visor, rear view mirror, windshield cleaner, dome light, non-skid cord tires, five disk wheels and heater.

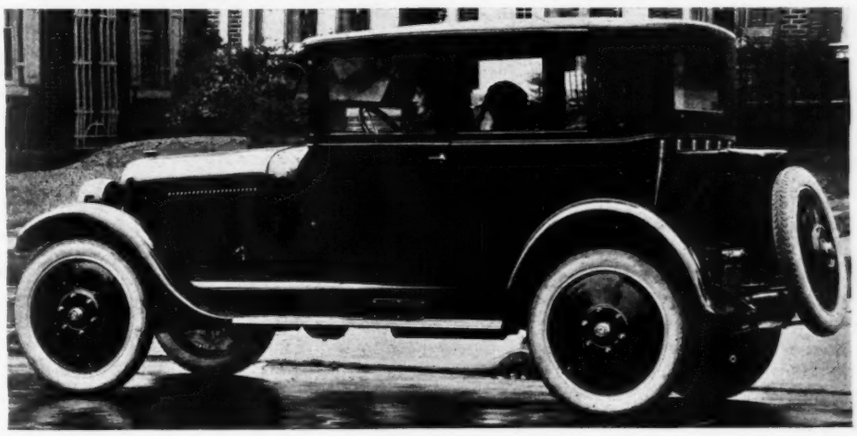
The windshield, of the double ventilating type, is of Chalmers design. The upper glass is hinged from the top; the lower from the bottom. Both sections swing outward and by this arrangement ventilation is controlled. The entire assembly is held all around in a rabbet.

Four New Models Added by Davis

FOUR new models including a phaeton, four-passenger sport, coupe and the "Californian" have been added to the line of the George W. Davis Motor Car Co., Richmond, Ind.

The Model 70 phaeton listing at $1195 is finished in royal blue with brown Spanish leather upholstery. It has nickel-plated radiator, disc wheels, military steps, skirt fenders, one-piece windshield, and similar features.

The Davis Legionaire, a four-passenger sport model, is finished in royal blue, and upholstered in blue pebble-grain leather. A khaki-colored top is novel in that it is made of imitation leather instead of cloth, insuring the same service and durability characteristic of the standard black top. The Legionaire is equipped with double-bar nickel-plated spring bumpers both front and rear, nickel-plated radiator, nickel-plated windshield, trunk rack and trunk, aluminum military steps and skirt fenders. lights. The Legionaire is listed at $1495.



New Chalmers Coach

The new light six coupe carries four passengers. It also is completely equipped and sells for $1795.

The "Californian," is equipped with a year-round top. The side panels of glass may easily be removed, thus transforming it into an open car. It is finished in royal blue and upholstered in brown Spanish leather. It is equipped with military steps, skirt fenders, disc wheels and one-piece windshield. The year-round top can also be fitted to the model 71 phaeton. The new models are all built on the Series 71 Chassis.
It carries six disc wheels, the two extra being mounted on either side, just ahead of the front doors. It is also equipped with drum headlights.

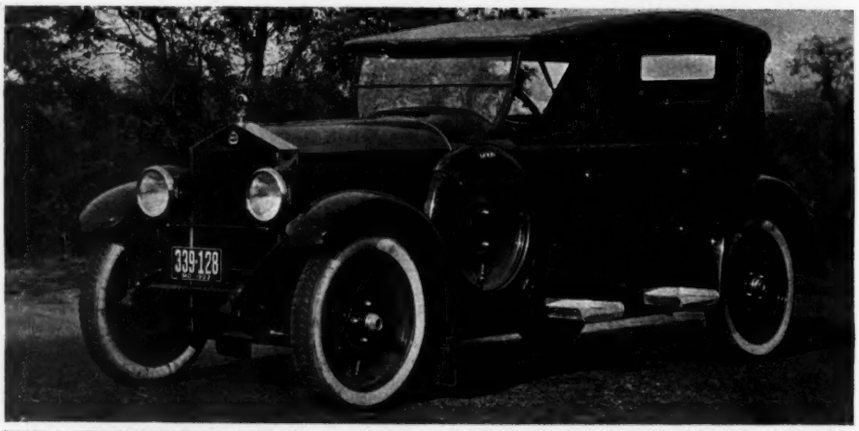
Moon Adds Two Sport Models to Line

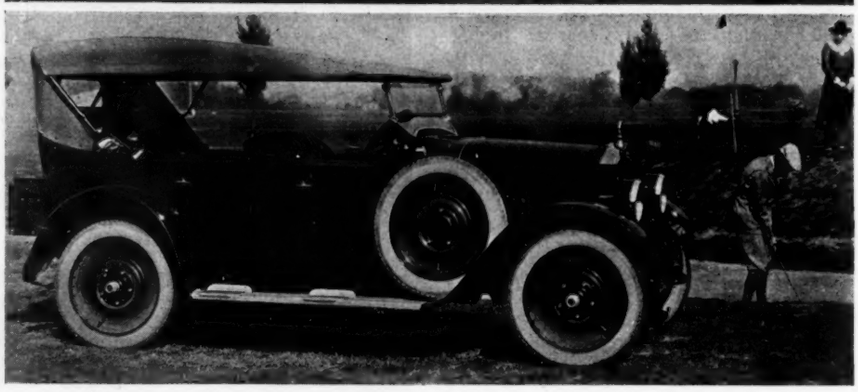
TWO new sport models, a Six-40 Sport Touring to sell at $1445 and a Six-55 Sport Touring to sell at $1885, have been added to the line of the Moon Motor Car Co. This makes eleven body types the company now offers. Special attention has been given to the trimmings and equipment on these sport models.

The Six-40 model has nickel head lamps, nickel cowl lamps, nickel tail lamp and nickel windshield, polished aluminum body rails and trunk rack including trunk; six disteel wheels, two spares mounted at front, khaki top, leather and body in distinctive Moon Sport color with two line stripe. Aluminum step plates with rubber pads add a factor of safety as well as neatness of trim in completing the car's sport features.

The Six-55 Sport Touring is a larger car of longer wheelbase. Features which make it definitely serviceable for touring are its low running gear, trunk rack and disteel wheel construction, with the two spare wheels mounted on the sides. The equipment also includes polished aluminum body rails, cowl lamps, individual steps and individual fenders.

Both models incorporate in their chassis the mechanical units which have featured Moon cars in the past. Deliveries of these models are being made to dealers now.





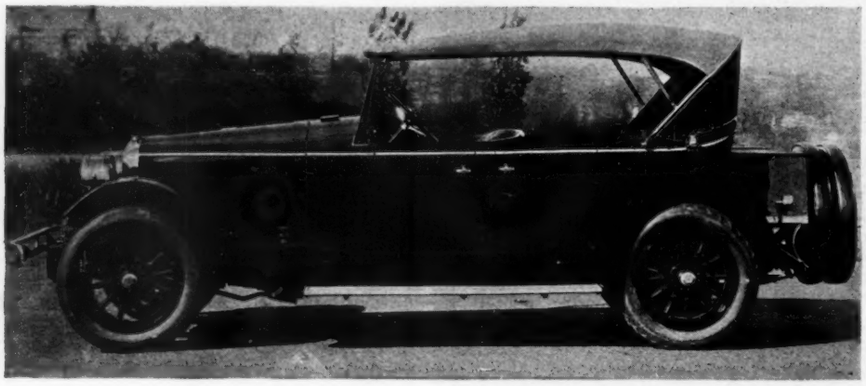
Pasadena Four-Passenger Sport Announced by Dorris

In keeping with the tendency of makers to build sport cars, Dorris has announced its four-passenger sport model called the Pasadena. It is built on the standard chassis.

The body is made with a high cowl and is somewhat longer than that of the Dorris four-passenger tourist. A trunk is mounted on an aluminum trunk rack attached to the frame at the rear of the car, together with a special tire carrier designed to carry two tires.

Stock colors for the new model are Holland blue, maroon and gun metal gray medium. A ¾-in. body molding extends over the hood to the radiator shell. Hand buffed leather is used in the upholstery. It is equipped with a top made of unlined Burbank material, the bows of which are in natural wood and finished with nickel plated fittings.

The instrument board is black walnut. A ventilator placed in the cowl is easily controlled from the dash. The windsheld stanchions are bronze, nickel plated. Regular equipment is artillery wheels with 33 x 5 in. cord tires. The 12 in. barrel headlights, radiator shell and bumper are all finished in nickel.



Crane Simplex Manufacture Resumed By New Company

NEW YORK, Nov. 13—The Crane-Simplex Co. of New York, Inc., with a factory in Long Island City and executive headquarters at 115 Broadway, has purchased from the Mercer Motors Co., the plant and assets of the old Simplex Automobile Co. and has resumed the manufacture of the Crane Simplex, discontinued in 1917, when the government took over the plant for war work.

Capitalized at $500,000

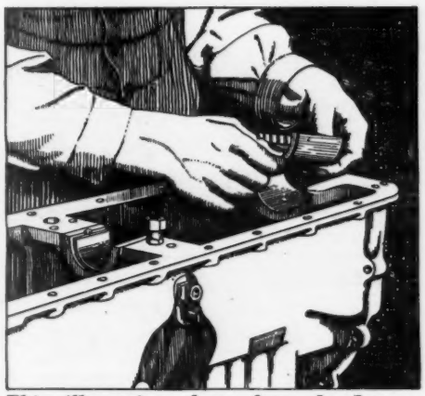
The new company, which is capitalized at $500,000, all preferred stock, will confine itself to the manufacture of the chassis only, which will list at $10,000 and which will be essentially the old Simplex with a six-cylinder engine with 4.375 in. bore and 6.25 in. stroke and a wheelbase of 143.5 in. It is planned to make 100 chassis a year and the output for the next five years has been taken by a selling organization, the Crane-Simplex Distributing Co., 200 West 59th street, New York. In addition, the new company also controls the Jepshon-Scott body plant at East Orange, N. J., formerly Quinby, and if a customer wills it, a Jepshon-Scott body will be fitted, although that is not compulsory.

Oakland Adopts Interchangeable Bearings

THE bearings used in Oakland engines are now the interchangeable type, the bearing materials being cast by the low pressure die casting method directly into the bronze backs. Chadwick bronze back babbitt bearings in the model 64 are used. It is claimed that this method produces a dense structure, the density being under control, thereby giving uniformity and also allowing the use of a pure tin bond which melts at 610 deg.

The interchangeable feature is, of course, obtained by accurately machining the bronze back and also the crankcase into which it fits so that it is possible to procure from any Oakland maintenance station a new bronze back bearing which can be inserted in place of the worn bearing without the necessity of line reaming the bearing after replacement has been made.

With this material manufactured in this way, freedom from wear is obtained and, in fact, this is used as one of the foundations for the 15,000 mile engine guarantee given by Oakland.

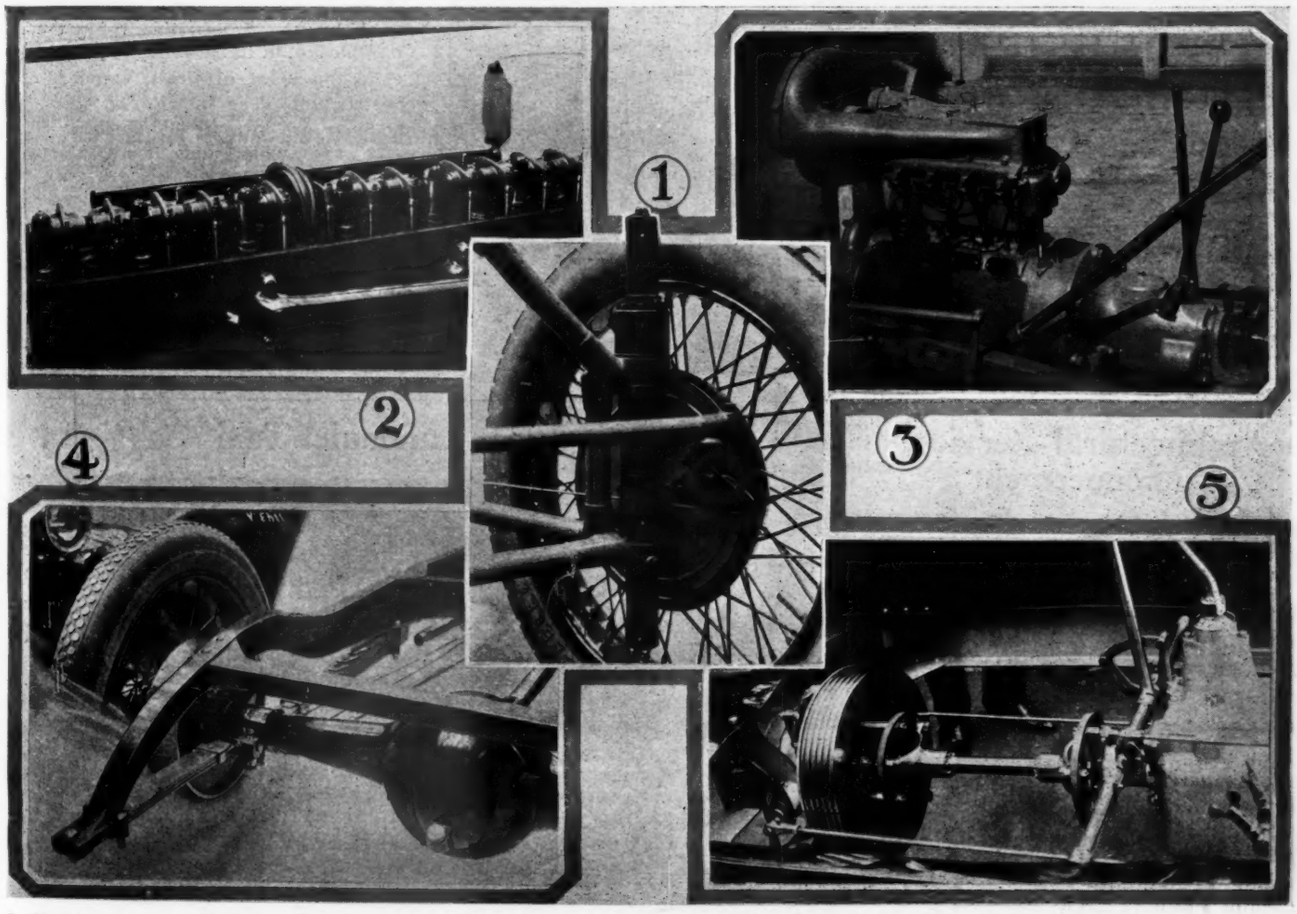


This illustration shows how the bronze back bearing in the Oakland engine can be removed in its entirety from the crankcase for replacement.

The babbitt bearing, while made approximately the same thickness, or perhaps slightly thinner than the usual type, is composed entirely of babbitt metal. A basis of the claim for superior strength and longevity in this bronze back construction is that the ultimate strength of bronze is 25,000 lb. per sq. in. while that of babbitt is 6,000 lb. per sq. in., giving, it is claimed, an increase in strength of over 400 per cent, while the hardness, or resistance to deformation caused by the impact of the explosion against the bearing has been increased 300 per cent. The makers claim that this result is accomplished by the use of the bronze bearing while still retaining its inherent advantages of the babbitt lining.

Another claim is that this type of bearing has a greater heat conductivity, amounting to 66 per cent over the plain babbitt type bearing. This, of course, would cause the bearing to run cooler and maintain the lubricating qualities of the oil.

A Few Interesting Features of Foreign Cars



1—Front spring suspension and brake on the Italian Lancia. 2—Overhead valve gear of the Fiat. 3—The S. A. R. A. four-cylinder 67 cu. in. engine. It is the only four cylinder air cooled engine used in France. 4—Salmson rear spring suspension on 10 hp. light car. 5—Hallot servo brake on transmission of Chenard Walcker. The car has no brake drums on rear wheels

Two New Busses Recently Announced

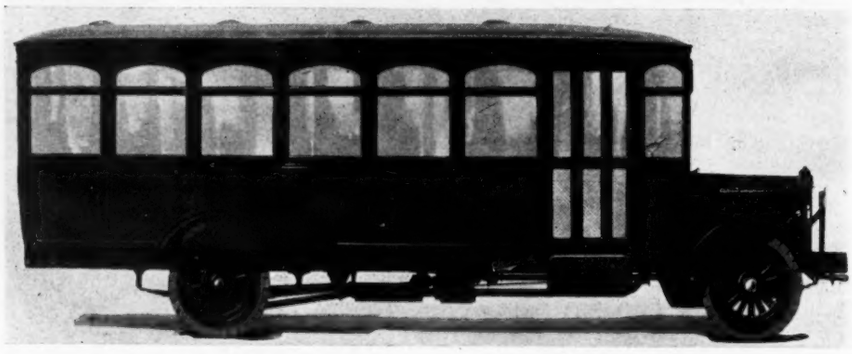
New Standard Bus

ANOTHER motor truck company has joined the ranks of bus builders. The Standard Motor Truck Co. has announced its model A-K bus, which has twenty stationary cross seats and a rear seat extending the full width of the body, wide enough for five passengers.

All passengers must pass the operator, who can make change and collect fare without leaving his seat. A light directly over the fare box and at the entrance is operated with the door switch.

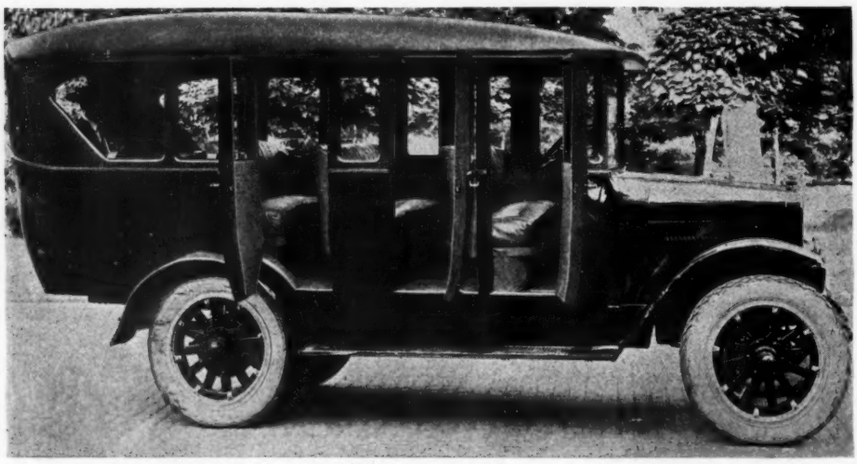
Each side of the body is provided with seven windows, the lower panes of which drop into pockets. Lighting is accomplished by six 21-candlepower, 12-volt lamps with limousine-type fixtures. The switch and fuse are located near the operator.

The bus has a wheelbase of 190 in. and the body weighs approximately 2800 pounds. Some of the major units in the



make-up of the chassis are a Continental engine, model L-4; Brown-Lipe gearset in unit with the engine; amidship type Brown-Lipe four-speed transmission; Spicer universal joints; Timken special bus type front axle; Timken worm-drive full-floating rear axle, with a reduction of 8.5 to 1; Sewell cushion wheels fitted with 36x5 tires front and rear.

The drive thrust from the rear axle is transmitted to the chassis through radius rods having a swivel eye at the front end to relieve the twisting. The troque rear action from the axle is taken by the rear springs, which are 58 in. long by 3 in. wide.



International Speed Sedan

WHAT might be termed a veritable de luxe bus has been recently introduced by the International Harvester Co., Chicago, in its Model S Speed Sedan.

The top is of art-craft, standard-car construction. The interior of both top and body are attractively finished. The seats are wide and deep-cushioned. Fourteen to fifteen passengers may be comfortably seated in the cross-seats from which they can obtain unobstructed view of the passing roadside. Entrance is obtained through three, good-sized, side doors while passage at end of the third seat gives easy access to the rear.

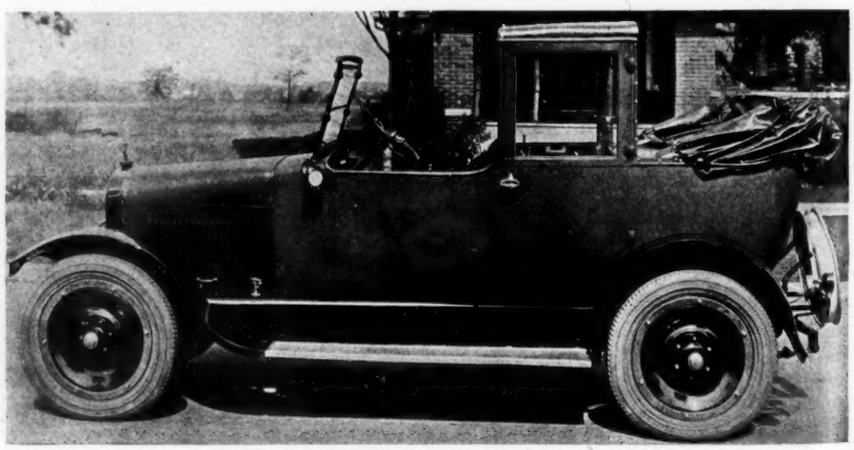
With the Model S chassis, speeds of 25 to 30 m.p.h. can be attained.

Architectural Service Announcement

For several years MOTOR AGE has supplied an individual architectural advisory service to all of those who requested the assistance of this publication in building problems. This service has grown to such an extent that a special pamphlet, "Building Suggestions for Automotive Dealers," has been published by MOTOR AGE and is sent to automotive dealers on request.

If you have building problems before you we would suggest that you provide yourself with a copy of this pamphlet and see if it does not answer your questions. If, after reading this pamphlet, you still have questions, ask them.

New Elcar Landaulet Taxi



This new Elcar Landaulet is a special job designed for the taxicab business in New York City

Four Cylinder, Small Displacement Models Feature London Show

Eighteen American Makes in Total of 159 on Exhibit at Great International Show—Smart Price Reductions

London, Nov. 3. (By Cable)

THE outstanding feature of the Sixteenth Annual London Motor Car Show, which was opened to the public yesterday after a private view to the Press and Trade on Thursday, is the record number of new models with four-cylinder engines under 120 cu. in. displacement, of the four-passenger type and selling at between $1250 and $2000.

These represent a continued endeavor to secure lower operating costs through the reduction of engine size together with higher engine efficiency; but while the general trend, as last year, continues toward smaller engines, there also exists a tendency to include the following:

(1) A number of makers hitherto specializing on large cars are introducing smaller models;

(2) A marked increase in the number of overhead valve engines, all of which that are of British manufacture have push rod valve actuation;

(3) A number of new small six-cylinder models of 80 to 200 cu. in. piston displacement;

(4) Reluctance shown by British makers to adopt front wheel brakes. Only two manufacturers offer them—Austin on a small car and Sunbeam as added equipment at a cost of $525.

The new British designs generally bear evidence that more consideration has been given to production costs, without, however, lowering the standard of body work, of finish or of the quality of the accessories. In response to a buyers' demand for better weather protection, framed, detachable side panels for open cars are now almost universally supplied. Some of these side panels have elaborate framing and attachments. On one car the panels are made of glass while on all others they are of celluloid. In the majority of cases these side panels must add appreciably to the manufacturing costs. Many are usable when the top is folded, the rear panels then forming a V-fronted shield for the rear passengers.

Closed Bodies Popular

Most makers are standardizing folding top sedans and some of the fixed type of sedan. Even for light cars these closed bodies are offered, at prices which usually range more than $500 above those of the open type, but the latter still form about 95 per cent of the total output. One fixed top sedan for light cars has a shell body, steel tube framing, all seats detachable, a central sliding door with frameless drop windows and no double paneling. This design has good possibilities as a light weight low-priced job.

The extensions to Olympia not being completed, the show is again divided between that building and the White City, a single admission fee being charged and free transportation furnished. Accessories, tires and cars of all sizes and all nationalities are exhibited in both sections of the show. However, the public again gives preference to Olympia, placing exhibitors at the White City under a disadvantage. Thirty of these latter exhibitors, including Dodge, Hupp and Paige, issued a combined appeal asking the press to emphasize the equal importance of their section of the show.

Besides forty-three British makes there are six French, five American (Case, King, Moon, Durant and Packard), four Italian and one Belgian makes on exhibit at the White City. The more fortunate American makes to whom the ballot gave space at Olympia include Buick, Chevrolet, Oakland, Cadillac, Chandler, Cleveland, Gardner, Essex, Hudson and Overland. The show is thoroughly international, except for the fact that the ban on late enemy productions is continued and that there are no representatives of the Dutch and Swiss industries.

A total of 159 makes of cars are being shown, which is an increase of four over last year. This list includes 96 British, 24 French, 18 American, eight Italian and three Belgian names. Including the accessory exhibits there are a total of 555 stands, as compared with 520 at last year's show. On 288 stands, including 51 of body builders, there are exhibited 758 cars, an increase of 78 over last year's show. This increase has been made possible more by the reduction in the average size of car than by any increase in the floor space. The total includes 109 bare chassis, the majority of them highly finished.

On Friday and on Saturday morning the attendance was materially below that of last year's opening days. No official figures are as yet available, but it is estimated that the reduction in attendance was from 30 to 40 per cent, which is ascribed in part to the imminence of the parliamentary elections. There was no overcrowding until the arrival of the usual Saturday afternoon sightseers, who entered at a reduced admission fee. Exhibitors with few exceptions report the business done so far to be disappointing.

Four-Cylinder Cars Popular

It is evident that the most popular type of car for 1923 will be a four-cylinder four-passenger model of 90-120 cu. in. piston displacement, selling at between $1500 and $2000. The corresponding six-cylinder cars are mostly new models and are not attracting much attention, buyers willing to pay the price asked for these models usually preferring the bigger fours. There is a fair demand for two-passenger fours at from $1000 to $1250. It is still too early to fully judge the 1923 prospects, the only certainty being that there will be unprecedented competition in nearly every field.

The president of the Society of Motor Manufacturers and Traders, at the inaugural function, was guardedly optimistic but deplored the difficulty in connection with export business while the present British motor taxation system continued, asserting that this system, which penalizes large bore, moderate speed engines, encourages a home demand for car types that are not popular overseas. The result is that output is restricted, which necessitates comparatively high prices.

Prices generally show a considerable reduction, although the drop is less on a percentage basis than at the 1921 show. The largest proportional price reduction since last year is shown by the American cars, averaging 20 per cent; the Continental reductions average 12 per cent, as compared with 23 per cent last year, and British reductions 15 per cent as compared with 17 per cent last year. The largest British reductions are on light cars and average 20 per cent.

Morris, who now has the largest output of any British maker and is planning a production of 15,000 cars for next year, caused a stir just before the show by announcing a second cut within six weeks, the two cuts combined amounting to 24 per cent. He now offers a four-passenger "twelve," of 102-in. wheelbase, at $1275, a figure which is unapproached by any other British make of similar specifications.

Comparative Prices

The largest actual reduction since the last show is on the Napier six, from $10,500 to $8,750, while the biggest single cut occurred on the Vauxhall "twenty-three," from $5850 to $4475. The Rolls-Royce "fifty" chassis at $9250, the Austin "twenty," five-passenger model, at $3475, and two Daimlers are the only British cars that are not reduced in price. The Cubitt "sixteen," of 170 cu. in. piston displacement, stands again alone on the price basis among full sized British five-passenger cars, having then reduced 24 per cent and selling at $1800.

This compares with the Essex at $2450, Maxwell at $1800 and Dodge at $1750, which latter cars carry a 30 per cent import duty. Only four British makers, including Napier and Lanchester, are specializing on the luxury type. Rolls-Royce is not showing the new "twenty,"

fearing that the stand would be monopolized by curiosity seekers who would crowd off legitimate prospects for both the "fifty" and "twenty."

British makers, with few exceptions, are increasing the number of their chassis models and body types, often in an endeavor to broaden their appeal in every direction. Daimlers are a conspicuous example. Besides introducing two small sixes, one of 87 cu. in. capacity and selling at $2050 for the chassis, the other of 132 cu. in. capacity and selling at $3125, both with four-speed gearsets amidships, following the practice of the three larger existing six-cylinder models, they are also making the 87 cu. in. six, with a three-speed unit power plant at $2250 for the chassis, and also a new four of the same dimensions as the 132 cu. in. six at $1625 for the chassis and a two-cylinder air-cooled "ten" at $1150 for the complete car with two-passenger body, all except the last mentioned model having Knight engines.

Many Chassis Models

On some models two chassis lengths are being offered, which results in a total of twelve types with fifty-five optional bodies.

Wolseley furnishes another example of this tendency, adding a four-cylinder "fourteen" to a range already comprising five distinct chassis from a two-cylinder "seven" to a six-cylinder "twenty-four," with optional chassis dimensions in several cases.

The new "fourteen" with side valves is a lower priced edition of the existing overhead camshaft model and sells at $2625 as compared with $3300, both being four-passenger cars. Many other instances of the same policy could be mentioned, some firms adding both larger and smaller models. The tendency observable immediately after the war to concentrate on one model has been completely abandoned. Sometimes the gearset, axles and steering gears are identical with those of earlier models, whereas the multiple model policy previous to the war usually inferred differences throughout the chassis.

The show is remarkably free from unorthodox designs. The new Lancia is here but there is nothing unusual deserving mention among British productions. The following percentages apply to individual models of all nationalities exhibited. Disregarding two-cylinder models, which show no increase in popularity, fours constitute 75 per cent, sixes 19 per cent, eights 5 per cent and twelves one per cent of the total, all of these figures being practically the same as last year.

Tendencies of Design

Detachable heads are found on 65 per cent of the models, a gain of 7 per cent. While the use of side valves decreased from 64 to 57 per cent, overhead valves with pushrods increased from 17 to 24 per cent and overhead camshafting dropped from 12 to 10 per cent. Models with sleeve valve engines increased from 7 to 9 per cent. Pressure lubrication has fallen from 61 to 49 per cent, while the splash-pressure system increased from 16 to 31 per cent and the simple splash system dropped from 23 to 29 per cent.

Magneto ignition shows a slight decline, from 87 to 84 per cent. Gravity fuel feed increased from 35 to 44 per cent, vacuum feed dropped from 58 to 44 per cent and pressure fuel feed advanced from 7 to 12 per cent. Aluminum pistons are now used on 48 per cent of the models as compared with 34 per cent last year. Pump circulation is found on 54 per cent of the cars, a drop of 4 per cent. Water temperature control increased from 5 to 9 per cent.

Cone clutches decreased from 46 to 44 per cent, single plate increased from 31 to 34 per cent, while the multi-plate type in both the dry and oil operated variety retained practically the same standing, viz., 14 and 8 per cent. Four-speed gear boxes increased from 51 to 55 per cent. Open propeller shafts remain the same at 47 per cent. Spiral bevels increased from 67 to 83 per cent, while straight bevels dropped from 20 to 6 per cent and the worm from 13 to 11 per cent.

The practice of placing all brakes on the rear wheels increased from 51 to 60 per cent while the practice of mounting the brakes on the wheels and the transmission has fallen from 39 to 20 per cent and four-wheel brakes gained from 10 to 14 per cent.

Extreme in Brakes

Carrying brakes on both the front and rear wheels and also on the transmission appeared for the first time, being represented on 4 per cent of the models, while on two per cent there were brakes on the front wheels and on the transmission. Cantilever springs dropped from 24 to 20 per cent, and half-elliptic from 59 to 55 per cent, while quarter-elliptics increased from 12 to 19 per cent and three-quarter-elliptic from 5 to 6 per cent. The number of new models of all nationalities exhibited was eighty-five, but of these about 50 per cent are not yet in production.

Considering British cars only, there is little change with respect to cylinder numbers, except that the sixes have increased from 13 to 15 per cent and the fours dropped from 77 to 75 per cent as compared with last year. Overhead valves show an increase of 24 to 33 per cent, including three models having overhead inlet valves only. Of the engines with overhead valves, 74 per cent employ long tappet rods, as compared with 56 per cent last year and 43 the year previously.

Helical gear drive for the camshaft in the crankcase increased from 22 to 28 per cent, some makers having experienced trouble with chains, which was generally due either to the use of too small a size or to incorrect application. Of the sixes, 48 per cent have block cast cylinders as compared with 10 per cent last year, this being largely accounted for by the increase in small sixes.

Air cooling has not yet made its appearance on British fours and sixes, but developments in this direction are expected before the 1923 show opens. Oil cooling is now used by two "twos" and one "four," although the latter is not exhibited. Pump water circulation decreased from 49 to 42 per cent. Cooling control, which was used on three cars only last year, is now seen on 13, including two 100 cu. in. "fours" with thermo-syphon circulation. Cellular radiators constitute 75 per cent of the total.

Cooling and Lubrication

Solid white metal casings increased from 30 to 64 per cent, nickeled brass, represented on 32 per cent, lost proportionately, while an aluminum shell is used on one make only. Three cars have a separate radiator shell.

Pressure lubrication dropped from 54 to 44 per cent, splash showing an increase of from 21 to 34 per cent, while the full pressure system is used on four cars only.

Aluminum pistons increased from 33 to 41 per cent, magneto ignition decreased from 94 to 88 per cent, while battery ignition increased from 6 to 12 per cent. However, several makers are using a magneto after first announcing battery ignition for new models, fearing the prejudice of dealers, who find that a magneto never prevents a sale but a battery does occasionally.

Vaporization is given more attention, but the various systems are quite orthodox. Cone clutches still predominate, but the single plate type increased from 33 to 36 per cent. Unit power plants increased from 27 to 48 per cent. Four-speed gearsets increased from 42 to 46 per cent, despite the number of new small cars. Worm drive gained one per cent and spiral bevel drive now stands at 76 per cent.

Straight side tires are beginning to gain favor, being standard equipment on 6 per cent of British cars, as compared with 1 per cent last year. The new adherents of this type of tire include such extremes as the Rolls-Royce on the one hand and the Singer, one of the most popular British light cars, on the other.

Trunks and Storage Space

Grease gun chassis lubrication and leather spring covers are now items of standard equipment on 25 per cent of all British cars. Rear trunk carriers are found on 15 per cent of all four-passenger models and rear folding windshields on six makes. The provision for storing frame side panels on open cars usually comprises a compartment behind the back upholstery hinged at the bottom of the front or rear seat.

Other plans include a pocket behind the front seat panel, large door pockets and a drawer under the rear seat. The body types on several makes of light cars with from 60 to 70 cu. in. piston displacement are miniatures of the close-coupled four-passenger type, the rear seat having restricted leg room and only accommodating two children or one adult sitting slantwise.

Steering From Maintenance Viewpoint

Conclusion of Adjustment and Lubrication Data. A Few Theories on the Cause of Wheel Wobble and a Resume of Current Corrective Measures

By PAUL DUMAS

SCREW OR NUT TYPE THE OHMER

THE Ohmer gear differs from most screw and nut type gears in that the nut is stationary so that actuation of the steering arm is accomplished through movement of the screw. The steering tube is provided with a spur gear fastened to it by taper and key. Movement of the steering wheel transmits motion to the two driven gears which are mounted in the cutaway portion of the screw nut. These screws are slidably fitted to the right and left handed screws and are constructed with splines or keyways which engage the threads of the screws, their function being to revolve the screws in their respective bearings in the stationary nut. The nut is attached to the housing and located therein by a tongue on its base fitted to a slot in the housing and held in position by four bolts, backed up by a suitable screw threaded through the upper end of the housing which absorbs the thrust and which provides the means for taking up the lost motion due to wear of the various parts. The movement of the right and left hand screws imparts motion to the trunnion shaft through the medium of the thrust blocks which bear directly on the hardened ends of the screws.

Should it be desired to change from right to left hand steering or vice versa it can be done by removing the nut from the housing. Each screw is then reversed in the nut, and the nut is reversed from its original position in the housing, thereby reversing the direction of the trunnion shaft in relation to the steering wheel.

Adjustment

Reference to Fig. 18, at "A" shows cap screws which hold the right and left hand nut in the housing. To take up lost motion in the gear proceed as follows: Loosen the four cap screws, tighten the thrust screw in upper end of housing just enough to remove unnecessary lost motion, retighten the four cap screws and the adjustment is completed. Turning the thrust screw down moves forward the nut and screws, together with the trunnion blocks as a unit.

Lubrication

Every 2000 miles remove housing plug and fill with Mobile oil "C" or equivalent, to filler plug level.

SCREW OR NUT TYPE THE LAVINE

The Lavine gear classified under the screw and nut type incorporates the split nut construction. The operation is similar to other gears of the screw and nut type. Briefly the action is as follows: The steering tube is rigidly attached to a right and left handed screw, which threads into a split nut. One half of the nut carries a right hand thread and the other half a left hand thread. Motion of the steering wheel imparts rotation to the screw which moves the nut halves upward and downward in their guides in the gear housing. Each half nut bears against a thrust block which in turn is journaled to the conventional trunnion shaft. The steering arm is fastened to the trunnion shaft by a nut which holds the arm onto the tapered splines machined on the end of the trunnion shaft. The gear is made in several models all of which contain the same actuating mechanism so that the illustration showing a section of the gear in Fig. 12, is sufficient to portray the constructional features. Cars and trucks using the Lavine gear are as follows: (Some of the truck chassis listed here no longer manufactured.)

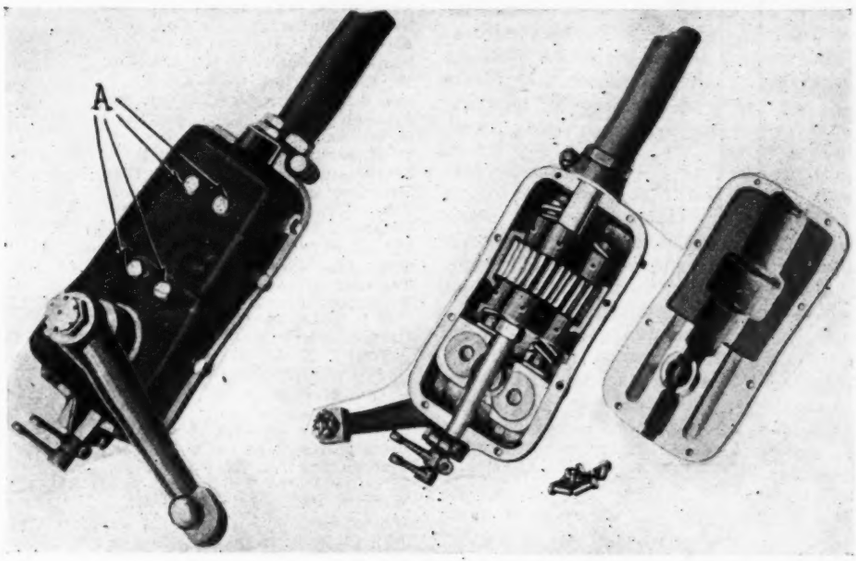


Fig. 11
Assembled and disassembled views of the Ohmer gear

NAMES OF CARS

Noma
Piedmont—4-30
Sayers
Winther
Crawford
Frontenac.

NAME OF TRUCK—MODEL

All American Truck—B.—B, BP, 423.
Available Truck Co.—H2.
O. Armleder Company.—1T.
Am. Commercial Car—C.
Atterbury M. C. Co.—B3.
Abbot Downing Top and Body Co.—A & E.
Aultman & Taylor Mach. Co.—15-30.
Athey Tractor Co.—1.
Belmont Motors—D2 Ton, D, A-½1.
Brockway Imp. Co.—E.—E, K4-2Ton, R3½.
Bessemer I mp. Co.—K2, J2.
Bethlehem Motors—F(bp-sk395, D & E, J, G, H.
J. I. Case T. M. Co.—6light, Farm.
E. G. Carr—grader, Farm.
J. I. Case Plow Works—truck, Farm, truck.
Commonwealth Motors—40, Taxi.
Chicago Imp. Co.—2½Ton.
Crescent Truck Co.—R1000.
Cook Motors Corp.—41.
Carroll Auto Co.—A.
Climber Motors Corp.—S-6 Cyl.
Arthur Chevrolet—Spd.
Dearborn Truck Co.—BW.
Detroit Motor Truck Co.—B.
Douglas Motors Corp.—Pass.
Detroit Motor Co.—A.
D-Olt Motor Truck Co.—A1½T.
DuPont Motor Mfg. Co.—Pass.
Economy Motors Co.—6-46.
Fulton Motor Truck Co.—C & D, F1, F-X, A 1T.
Foulton Nat'l Truck Co.—10E.
Federal Truck Co.—2003M.
Fremont Motors Corp.—RLH, RRH.
Gary Motor Truck Co.—FRH, F, H&HV, K.
General Motor Truck Co.—201-10, 201-11, 201-18, 201-5, 201-22, 201-8, 201-9, 201-7.
Garford Motor Truck Co.—15.
Gramm Bernstein—10.
Hoover Wagon Co.—20A.
Hahn Motor Truck & Wagon Co.—1 Ton, 2 Ton.
Huffman Brothers— A & B.

Haynes Automobile Co.—55.
John W. Henney & Co.—6-45.
Holmes Motor Mfg. Co.—1921.
Hupp Motor Car Corp.—B-P, 47016.
Handley Knight M. C. Co.—A.
Hebb Motors Co.—1½T.
Hamilton Motors Co.—E, Fulton.
H. & M. Motor Co.—F-X.
Heiden Mfg. Co.—E. B-P.

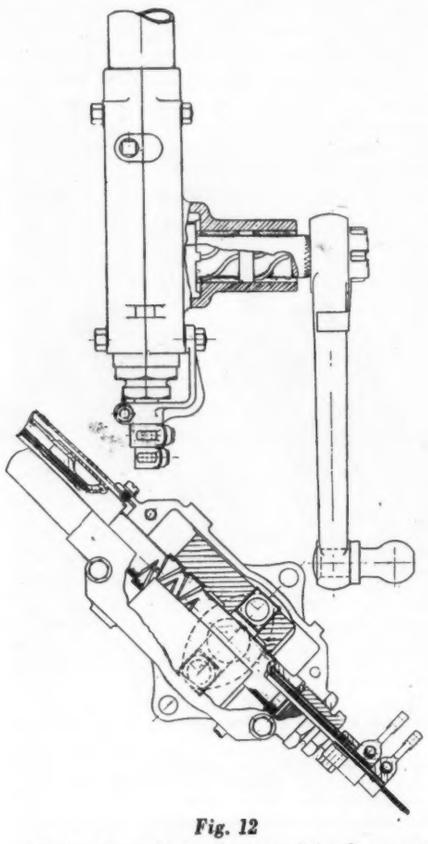


Fig. 12
Section through the Lavine with adjustment at bottom of housing

Indiana Truck Corp.—19572, 9739, B-P, 27571, 14571, 9560, 9569, 9587, 14572, 3000 lb.
Independent Motor Truck—E&F.
Inland Motor Co.—D2, C1½T.
Capt. D. Jones Auto Co.—A.—6-42.
Kline Car Corp.—Ser H.
Kissel Motor Car Co.—Part, 95054.
H. J. Koehler Motors Co.—M, B-P, k9-27-a.
Kearns-Dughie Motors Co.—H, N, H-Ser., 50.
Rud. E. Kerlin—Trac., Trk.
Luedinghaus Espenschied Co.—A.
Lorain Motor Truck Co.—D.
Lone Star Imp. & Trk. Assn.—1½Trk.
Lexington Motor Car Co.—T.
Lansden Company—750.
Marwin Truck Corp.—439.—440B.
Myrick Machine Co.—Trk.
Minneapolis Steel & Mach. Co.—AW, BW.
Moline Plow Works—1T, Part.
Mercer Motors Co.—20371.
Nash Motors Co.—6691-92, B-P, 52323a, 32426a, Part, 51314a.
Nelson & LeMoon—F2, E1, E3½E5, E2, F1, FC5, Type 3, F3½F5.
Noble Motor Truck Co.—AB, E.
Noma Motor Co.—AA.
National Steel Car Co.—GA.
Napoleon Motors Co.—35-9-11.
New England Truck Co.—H2½, bp-sk-338.
Oneida Motor Truck Co.—2T-Elec, bp-sk-338, 5T-Elec, Sk-405, C9, A9-B9, rhdrive.
Ohio Tractor Co.—A.
Piedmont Motor Car Co.—6 Cyl.
Pioneer Tractor Mfg. Co.—G.
Parker Motor Truck Co.—M20, J20, bp-d6529.
Paige-Detroit Motor Car Co.—15-19, B-P, C50027, 5219.
Perfection Truck Co.—C, R6.
Ranier Motors Corp.—1-1½T.
H. B. Ross—Trktr.
Russell Co.—15-20, 20-35.
Reynolds Motor Trk. Co.—7a & 10a, 5a & 3a.
Republic Motor Trk. Co.—10-11, 19.
Sterling Machine & Stpg. Co.—B-P.
Sayers & Scoville Co.—6073Sp, B-P, 6073, 8534-4.
Signal Motor Truck Co.—J, R.
Severin Motor Co.—H.
Stoughton Wagon Co.—V-1, E-3T.
Service Motor Trk. Co.—15, B-P.
Studebaker Corp.—50750.
Standard Motor Truck Co.—56.
St. Cloud Truck Co.—A.
Six Wheel Truck Co.—3½T, 2T.
Stansell Masons, Ltd.—6-57.
Semmens Motor Co.—A.
O. E. Szekeley Co.—2, 5, B-P.
Steinmetz Elec. Motor Car—15399, Tioga, 3.
Tegetmeier & Riepe Co.—4, B-P.
Titan Truck Co.—2a-1069.
Triangle Motor Truck Co.—A, T.
Triumph Trk. & Tractor Co.—Trac., H.
Towmotor Co.—B, B-P.
Templar Motors Corp.—30226.
Transport Truck Co.—15, bp-exp., 4478, 15, B-P, 4030, Part, M-70, 70, 70, 52.
United States Motor Truck Co.—S, U, 1-Ton, T, N, & NW, R, DJ, KW, Wharton.
U. S. Products Corp.—OX-5.
United Motors Co.—V, C.
Vulcan Mfg. Co.—1.
Viall-M-Car Co.—B2.
Velie Motor Vehicle Co.—V-458.
Victory Tractor Co.—A-18.
Winther Motor Truck Co.—39RH, 39LH.
Wichita Falls Motor Co.—E¾.
White Hickory Wagon Co.—1 Ton, 2½, M, 3½T.
Watson Wagon Co.—¾T, 1½T.
Western Iron Works—2T.
Wis. Farm Tractor Co.—½-1T, B-1, 1½T, Pr. C ar.

Adjustments

To remove lost motion from the hand wheel of Lavine gears with **outside gas and spark controls or gears with no controls.** Fig. 14.

Loosen adjusting screw nut 1, which is located at the extreme lower end of the gear housing, turn adjusting screw 2 clockwise a trifle and then try hand wheel to find out if you have the right road feel. Repeat the above operation until you have approximately 1½ in. of lost motion on the steering or hand wheel, which is considered about right by most drivers. It is then necessary to tighten the adjusting screw nut 1 against the gear housing to hold the adjusting screw 2 in place.

For gears with inside controls. Fig. 13

Loosen adjusting screw nut 1, Fig. L2, which is located at the lower end of gear housing, turn screw 2 clockwise a trifle and then try hand wheel to find out if you have the right road feel. A backlash of about 1½ in. is usually allowed by most drivers, although less or more backlash can be secured. It is then necessary to tighten the adjusting screw nut 1 against the housing to hold the adjusting screw 2 in place. Loosen set screw 3, then loosen the taper nut 4, which anchors the controls, and put controls on the top of steering or hand wheel in their proper place, then tighten taper nut 4 and set screw 3.

Lubrication

An oil hole is provided in the steering wheel hub to provide lubrication for the upper bushing of the steering mast or post. Oil should be applied at this point every 30 days, or at intervals of 300 to 5,000 miles.

The gear is lubricated by removing the housing plug and injecting a good grade of medium heavy grease every 30 days, or every 4,000 miles.

SCREW AND NUT TYPE THE DAYTON

The Dayton steering gear has only recently been placed on the market. It is of the screw and nut type and its operation is similar to the Lavine.

This gear is factory equipment on the following chassis: Ranger Six.

Adjustment

As is the case with most gears of the screw and nut type, only one adjustment is provided. Movement of the nut located at the top of the gear housing produces a corresponding movement of the thrust bearing located just beneath it. Clockwise rotation of the nut decreases the amount of lost motion in the screw. The location of the adjusting nut is clearly shown in the views of the disassembled gear in Fig. 3.

Lubrication

The housing should be kept filled with non-fluid oil or heavy steam engine oil.

CAM TYPE GEARS THE DITWEILER

The cam type gear is of comparatively recent origin, and to date has not been carried as regular equipment on any of the American-built cars. It has met with considerable favor in Great Britain, being produced in that country by the Marles Co.

The operation of the gear is easily understood by reference to drawing at Fig.

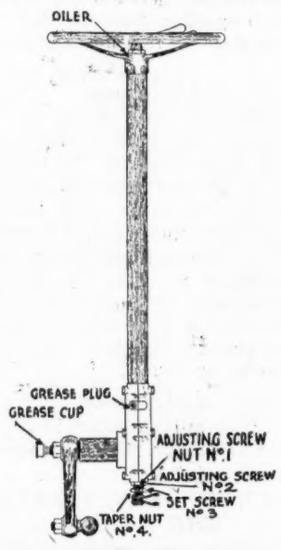


Fig. 13
Lavine with inside gas and spark controls

4. Briefly, there are two cams each having a contour similar to that shown at the top of illustration. These are keyed to the long post shaft and are located with their maximum radius directly opposite each other. The shaft on which the cams are carried is mounted for journaling in two bronze bushings, whose outside diameter is eccentric with the bore.

The trunnion shaft is mounted at right angles to the cam shaft and carries two rollers which bear on the face of two cams. Movement of the steering wheel, with which the cam shaft is connected, will cause a corresponding movement of the trunnion shaft.

Adjustment

Lost motion in the steering wheel is removed by moving the cam shaft closer to the trunnion or pitman shaft. This is done by loosening the locking set screw, located just above the gear housing, and rotating the eccentric bushing in a clockwise direction.

Up and down play is removed by screwing up or down on the nut which controls the up and down movement of the same bushings.

Lubrication

Same as for worm and wheel model.

Steering Gear Manufacturers and Lubrication

The steering wheel gear stands out prominently as being one of the units of the motor vehicle that generally is neglected by the vehicle operator, especially from the standpoint of lubrication. Of the steering gears serviced by a prominent manufacturer, 75 per cent were in need of repairs because of insufficient or improper lubrication. Where the repairs were necessary on account of improper lubrication the cause was definitely traced to the wrong lubricant being used in the gear housing.

Many manufacturers send their gears out packed with a heavy graphite grease which is sufficient to take care of lubrication of the gear for about three to four thousand miles. After months of service the moving parts of the gear have worn a path through the originally wellpacked grease, which becomes banked up in some corner of the housing where it does little or no good as a lubricant. Additional grease must then be forced into the housing or the original grease thinned with oil to prevent damage. Manufacturers who send out their gears with heavy grease always instruct the buyer to thin the grease at regular intervals by the addition of cylinder or steam engine oil. Failure to replenish and thin the grease with oil accounts for much of the premature wear present in the internal parts of a gear.

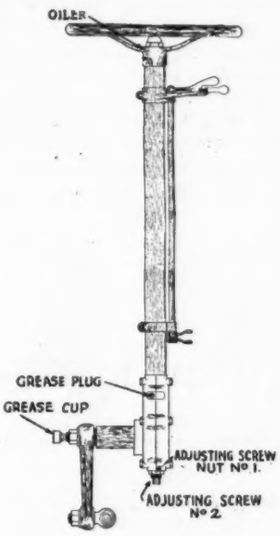


Fig. 14
Lavine with outside gas and spark controls

Greases that appear similar to the eye may have widely different characteristics after they have been in use for a few months. For this reason it is always advisable to follow the car or gear manufacturer's recommendations regarding the make of grease best suited for the gear. Generally speaking, the average operator and owner will use a grease that is entirely too heavy, and in this regard let it be said that, where the name of the recommended lubricant is not given by the car manufacturer, nothing heavier than a non-fluid oil should be put into the gear housing.

There is a decided tendency among steering gear manufacturers to recommend the use of steam cylinder oil instead of grease for the housing lubricant. Graphite is deflocculated form is sometimes added to the oil, while some gear manufacturers advise against the use of anything except heavy steam cylinder oil. Where the maintenance operator is in doubt as to the best lubricant for any particular gear he is safe in using a non-fluid oil or steam cylinder such as 600W.

Lost Motion and Hard Steering

Lost motion in the steering mechanism is often blamed on the steering gear proper when, as a matter of fact, the trouble is often due to other parts of the

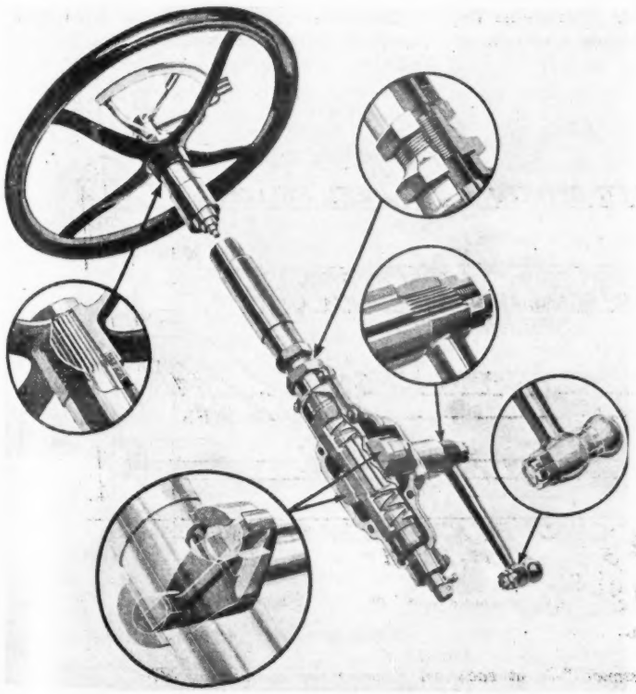


Fig. 15
Disassembled views of screw and nut type Dayton gear

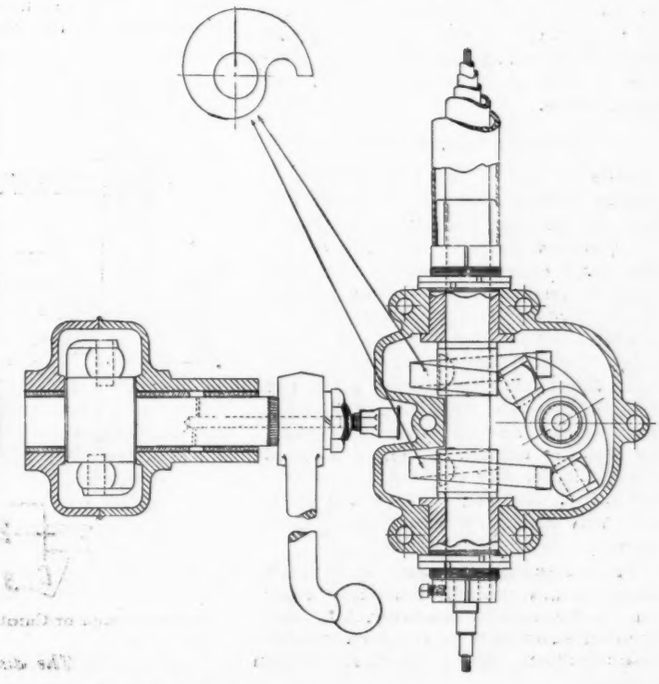


Fig. 16
The Ditweiler cam and trunnion type gear

steering system. The location of lost motion and the cause of hard steering can be determined by the elimination process.

Common causes of hard turning of the steering wheel are as follows:

No lubrication on steering column upper bearing directly under steering hand wheel.

No lubricant in steering gear housing.

Distortion or misalignment of dash in relation to steering column (Poor factory assembly or an insecurely fastened dash produce misalignment.)

The remedies for the above troubles are obvious and wedges of the proper shape and thickness can be used to align the column bracket with the dash.

Granting that the steering gear proper does not have undue resistance to turning, hard steering in the remainder of the steering system may be traced to one or more of the following conditions:

Lack of lubrication at spindle king pins.

Lack of lubrication at ball joints.

Lack of lubrication at steering arm bearings.

Bent steering arm.

Bent steering tube.

Too much tilt or castor of front axle.

Bent front axle.

Misalignment of king pin centers due to inaccuracy in manufacture.

Misalignment of front axle spring pad centers due to inaccuracy in manufacture.

Tight front wheel bearings.

The last five conditions manifest themselves by hard steering of the car when on the road and cannot always be detected by just jacking up the front wheels. If the steering is normal when the wheels are relieved of the load of car, that is, when they are raised from the floor by jacks, but difficult when the car is operated on the road, the system should be carefully checked for the presence of one or more of the last five named items.

Steering Gear Rattles

Rattle is one of the most elusive of steering system troubles. A rattle any place in the rear portion of the frame will manifest itself by a rattle at the mast head of column where the hand wheel is located. The steering column has peculiar acoustic properties and will telegraph the various car rattles to the wheel. Some manufacturers have eliminated this trouble by placing a felt pad or shim between the steering housing frame bracket and the frame anchorage. The steering column tubing, if allowed to work loose, will produce a very distinct rattle. End play in the worm wheel shaft will set up a sometimes elusive rattle.

The steering gear proper is as fully reliable and trouble free as any other unit of the vehicle assembly, but, like the other units, it must be given reasonable attention. The items of lubrication and adjustment are most vital in maintaining the steering gear at a high point of efficiency.

Why the Wheels Wobble

The sales engineer of a prominent steering gear manufacturer recently stated that cord tires were responsible for more shimmying of the front wheels than any other single factor. His explanation is based on the fact that cord tires are considerably larger in all dimensions than fabric tires of the same rim size. Especially is this true of that dimension of the tire measured across its diameter.

On a few cars the stub or spindle is so designed that for a certain chosen tire

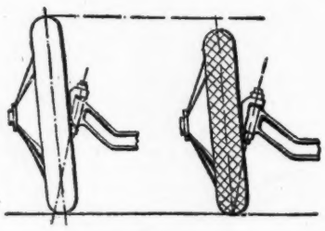


Fig. 17

How fitting oversize tires changes position of king bolt center in relation to tire

diameter the center of road contact of the tire will coincide with the center of the king pin axis when projected. Increasing the diameter of the tire serves to place the king pin axis outside the point of contact of the tire on the roadbed. The effect is clearly shown by reference to the illustration at Fig. 17.

When the point of tire contact with the road and the king pin bolt axis coincide there is practically no turning moment about the king pin axis. Increasing the diameter of the tire creates a couple or turning moment equal in value to the horizontal distance between the point of road contact of the tire and the king pin axis. The wheels, passing over an uneven roadbed, impart alternate compression and tension through the steering cross bar or connecting rod which, in turn, sets up a series of oscillations of the road wheels which are imparted to the hand wheel, and the result is shimmying.

However, on most American cars the king pin axis with the regular tire equipment does not coincide with the center of road contact of the tire, but almost with the inner edge of the tire. Most king pins on front axles of American make have their axis slanted inward towards the starting crank of the engine, and in that case the installation of an oversize tire would tend to bring the axis in line with the center of road contact of the tire, unless, of course, the tire was more than two oversizes larger than the original tire for which the spindle was designed.

The effects of wheel wobble are pretty generally known, but a thorough knowledge of the exact course of these effects is lacking. Many plausible theories have been advanced by authorities on steering, but to date it is unlikely that any one designer can be found who can lay out the design of a vehicle with absolute assurance that the job will be free from wheel wobble under every condition of operation.

Before discussing the causes it may be interesting to review some of the corrective measures that have been successfully applied to a varied line of chassis.

Installing wedges between springs and axle to give more or less cant or castor to the king bolt.

Removing all backlash in pins and bushings of the steering system.

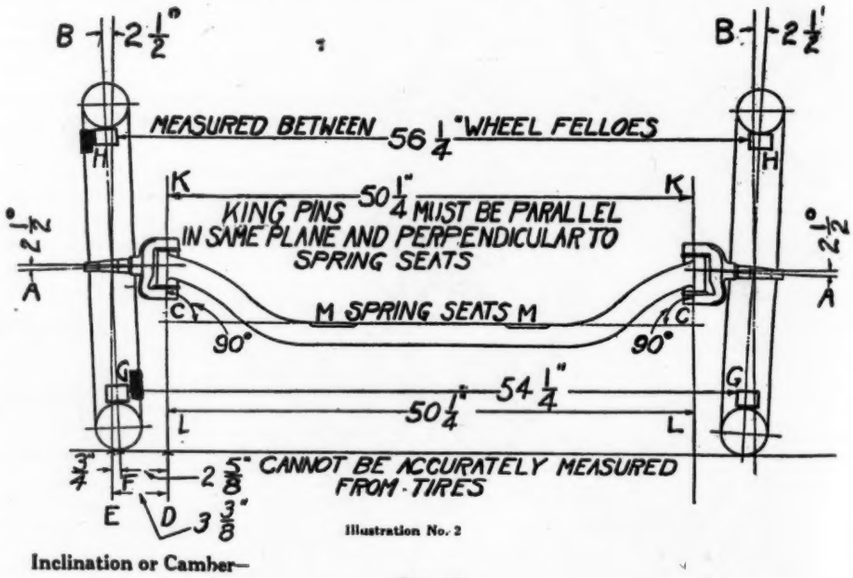


Fig. 18

The distance "B" at each wheel denotes the camber angle

The lists printed with the description and data of each gear are taken from the Class Journal truck and passenger specifications. It is possible that some chassis manufacturers have adopted different steering equipment since the compiling of this list, which was done during the first months of 1922.

Installing a heavier gage connecting rod or tie bar.

Balancing the front wheels.

Tightening rear anchorage of torque arm.

Stiffening car frame by installing additional cross members.

Installing heavier coil springs in drag link.

Installing stiffer front springs.

Installing steering gear having greater degree of irreversibility.

Changing camber of front wheels.

Changing location of steering ball arm.

The first mentioned change has cured wobble, or at least prevented the oscillation of the wheels from being transmitted to the steering hand wheel. The curvature and degree of deflection of the front springs under different loads will determine the amount of castor best suited, which is usually found by the trial and error process. Castor is said to produce, or at least accentuate, wheel wobble, and the same may be said for too little castor. Generally speaking, the maximum castor angle should not be in excess of 3 degrees and not less than 1 degree.

Spring Pads Cause Non-Uniform Angle

The fact that many front axles are not machined at all surfaces, especially at the spring pads or seats, oftentimes causes a variation of the recommended castor angle. The relation between the spring seat angle and the angle of the front spring at the point of anchorage determines the castor angle. Inspection of a steering system to find what is producing wheel wobble should cover this point, especially among the large production, popular priced type of chassis.

If the king bolt centers are out of alignment there will be produced a similar effect. The two king pin bolt holes should be in the same plane vertically and should be parallel. The length of the rear shackle of the front spring determines the angle of the front spring and axle with the horizontal and consequently is a factor determining the castor angle. Where different springs have been installed or where the axle spring seats are not uniform, there results a variation in the castor angle, which is usually overcome by the insertion of wedges with the thick end pointing to either the front or rear, depending on whether it is desired to increase or decrease the castor angle.

An illustration showing the proper castor angle specification for a certain popular priced car is shown at Fig. 18. The wedges shown in this cut are inserted to decrease the castor angle, as it was found that more than 1 degree tilt of the axle produced hard steering at low speeds and the road wheel oscillations were felt on the hand wheel.

Vertical Mounting of King Bolt

The ideal location in many respects for the axle is mounted in a true vertical position. Although tilting the axle forward or backward at the top may have a self-righting tendency under certain conditions, such location has also some disadvantages. If the axle is tilted back at the top, the turning of the steering wheel will either compress or lengthen the front springs vertically, depending on the direction of the turn made. The same holds true when the top of the axle is tilted forward, although in a right-hand turn the right side of the car is lowered, which is the opposite of what occurs when the axle is tilted backward at the top.

This raising and lowering tendency of the castored axle is claimed by some to act as a damper on the inherent tendency of the wheels to wobble. At the same time it cannot be denied that the same raising and lowering tendency, which must be absorbed by the springs, produces vibration, and if any portion of the chassis has a period of similar frequency, the whole steering system will tend to vibrate with it and oscillation of the wheels will result.

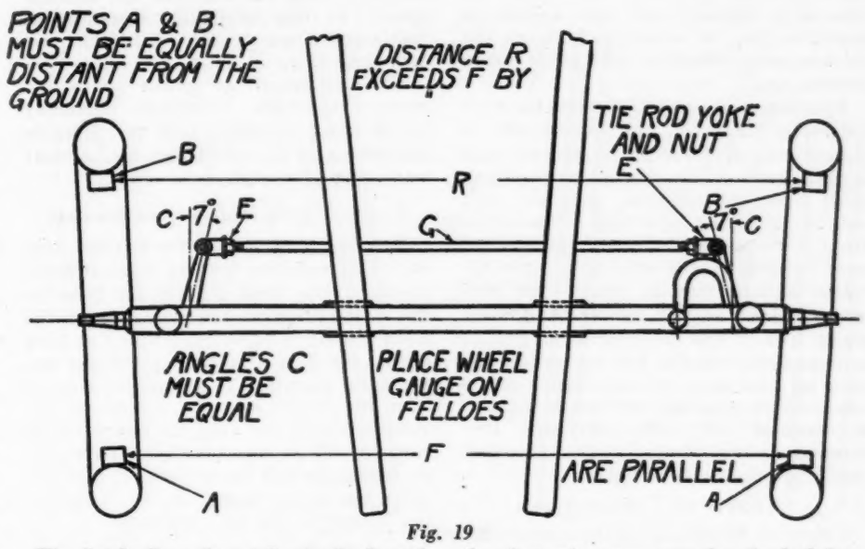


Fig. 19

The "gather" or "toe in" of wheels and angle of steering arms can be checked by reference to this cut

One Manufacturer's Method

The spring suspension layout on some cars is such that when fully loaded the spring deflection is such that the front axle has a considerable amount of tile backwards at the top. This probably accounts for the fact that these same cars will steer better fully loaded than when only the front seats are occupied or vice versa. One well-known car manufacturer sets the front axle so that when only a half or partial load of passengers is in the car the axle is vertical. Then with the car fully loaded the deflection of the springs is noted and the castor angle measured. This same firm allows a maximum of one degree backward tilt of the axle at top when the car is fully loaded. To secure this limit the axle when car is empty often times has a forward tilt at the top or opposite castor.

Generally speaking, cars that have considerable castor handle nicely on straightaway driving but are hard to handle at the angles of medium and maximum turn.

The action of the car when turning is a fairly good indication of where to search for the cause of wheel wobble. If the steering is erratic when pulling out of a rut, or when crossing from one side of the road to the other at moderately sharp angles, the angle of the axle should be changed to secure as near a vertical position as possible.

Testing Wheels for Camber

Closely related to the effects produced by improper castor angle are the effects of too much or too little camber. Camber is given the front wheels by constructing the wheel spindles so that when installed they (the spindles) are at an angle with the horizontal. This angle cannot be accurately measured using the tires as a datum point, so all measurements should be made on the wheel felloe. The camber angle cannot change unless the axle has sagged or the spindles have become bent through sagging or accident.

If an error is suspected the spindles should be removed and bars placed through the axle eyes. If the bars show that the eyes are parallel and in the same plane, the variation in angle will then be blamed on the spindle bearings or the spindle body itself. The illustration at Fig. 19 is for a front axle with a recommended camber of 2½ degrees. It should be remembered that camber angle represents the difference in distance between the wheel feloes, measured at the **top** and **bottom** of the wheel, and should not be confused with "toe in," which is the difference measured at the front and at the rear of the wheels at the felloes.

Measuring Toe-In

Measurement of the "toe-in" is always made at the height of the wheel hub cap and varies as to value from ⅛ in. to ⅝ in. on the different chassis. A general average is between 3/16 and ¼ in., with the wheels in the straight ahead position. When checking the "toe-in" on a suspected car, it is advisable to check at the same time the steering arm angle, with relation to the center line through

the length of the front axle. The top view of a typical front axle system is shown in Fig. 19, which also shows the recommended steering arm angle for a certain axle.

Steering gear manufacturers lay considerable stress on the importance of maintaining a three-point straight line arrangement of the trunnion or pitman shaft arm, the steering arm ball and the front spring eye bolt. When the front wheels are deflected, due to the road conditions, the axle will move upwards and backwards, which will tend to whip the drag link forward and backward, and if the steering arm, pitman arm and eye bolt of the spring do not form an unbroken line the change of the angle of the steering arm when the axle is deflected will whip the drag link through a wider range and thus transmit the action to the hand wheel.

Inherent Tendency

There is reason to believe that the tendency for front wheels to wobble lies in the wheels themselves and that the various cures which have been accomplished by other means have been cures only to the extent that they prevent the transmission of the oscillations to the hand wheel. This theory seems further strengthened when it is known that wheel wobble, which was so serious that it was impossible to hold the steering wheel, has been overcome by tightening all king pin bearings and joints, which dampened the road wheel shocks before they could reach the steering wheel.

It is also known that steering gears having a high reduction ratio and great irreversibility greatly reduce the effects of shimmying of the wheels at the steering hand wheel. At the same time it seems that, if an out-of-balance condition of the front wheels is responsible for shimmying or wobbling, the effects of the unbalanced condition should increase in intensity with an increase in car speed.

Observation of a certain case of wheel wobble where it was known that the front wheels were slightly out of balance did not disclose any tendency for the steering wheel to oscillate with greater violence with an increase in the car speed. In this particular instance the maximum hand wheel oscillation occurred at 18 to 22 m.p.h. and almost entirely disappeared at speeds above and below that mark. However, balancing of the front wheels served to eliminate the effects at all speeds, as far as their being felt at the steering wheel.

Front Wheel Balance Important

Regardless of the constructional layout of the steering system, it is advisable to check the front wheels for balance, for, in addition to the tendency of the front wheels to leave the ground at high speed, there is also set up by the unbalanced condition a horizontal component that tends to revolve the wheels about the king pin axis, the degree of its violence being determined by the extent of unbalance and the horizontal distance from the heavy point on the wheel to the center of the king pin axis.

Experiments have been carried out in this country, and in Great Britain, by placing weights on the front wheels, which proved conclusively the existence of a very pronounced turning moment around the king pin axis when the weight was placed away from the center of the king pin axis. In one case a weight of 14 pounds was secured to a front wheel and at a speed of 35 m.p.h. this weight developed a centrifugal force of 600 pounds. The car being light, this force was sufficient to show a decided up and down movement of the wheel, when the mud guard was removed.

In one of these trials the weight was placed on the outside of the wheel so that the plane in which the weight revolved was 4 in. from the center of the king pin axis and therefore the turning moment was 600 by 4 in. equals 200 ft. lbs. In this case it was found that, at over 12 m.p.h., the steering was decidedly unpleasant. At the second trial the weight was placed on the other or inner side of the wheel felloe, so that the plane in which it revolved was 1 in. from the center of the king pin. The turning moment around the king pin being thus reduced, it was found that the wobble had very much diminished, being hardly noticeable until a speed of over 20 m.p.h. was reached.

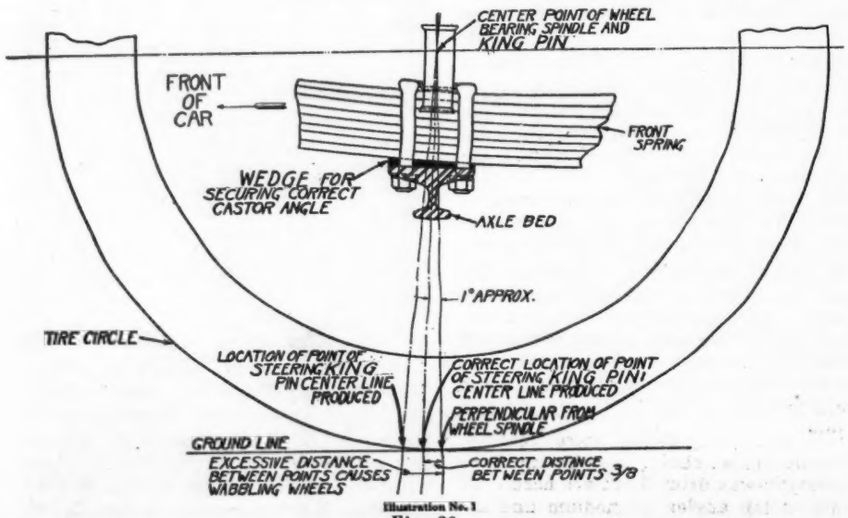

CENTER POINT OF WHEEL BEARING SPINDLE AND KING PIN
FRONT OF CAR
FRONT SPRING
WEDGE FOR SECURING CORRECT CASTOR ANGLE
AXLE BED
1° APPROX.
TIRE CIRCLE
LOCATION OF POINT OF STEERING KING PIN CENTER LINE PRODUCED
CORRECT LOCATION OF POINT OF STEERING KING PIN CENTER LINE PRODUCED
PERPENDICULAR FROM WHEEL SPINDLE
GROUND LINE
EXCESSIVE DISTANCE BETWEEN POINTS CAUSES WABBLING WHEELS
CORRECT DISTANCE BETWEEN POINTS 3/8
Illustration No. 1

Fig. 20

Determination of the amount of castor of a typical front axle. In this case a wedge has been added to decrease the castor angle

Frame manufacturers have been instrumental in securing better steering by educational work among car manufacturers. It has been shown that a car frame that is too flexible, transversely and longitudinally, has been the cause of very erratic steering, especially on rough roads. It is assumed that the distortion of the frame members brought about a similar change in the relative distances and angle of the steering mechanism.

The installation of a different body or the installation of rear springs which raised the rear portion of the body or chassis have been traced as causes of wheel wobble. In this instance the changes affected the weight distribution on the wheels and affected the angle of the front springs, with a consequent change in the castor angle.

It is generally conceded that the steering gear proper cannot cause wheel wobble but that the design of the gear, regarding its degree of reversibility, has considerable to do with the amount of steering wheel oscillation produced by the wobbling front wheels.

Conclusions

The subject is not a new one and has been discussed for years. There appears to be a lack of uniformity of opinion as to the cause, because of the fact that the remedies used to effect a cure have lacked uniformity. The application of a certain remedy which was effective on a certain car of a certain make was very often ineffective as a cure on another car of the same make and model. For better diagnosis of wheel wobble, it would seem that it should be divided into shimmying which occurs when the car is traveling over perfectly smooth roads and shimmying which is present only when the road surface is irregular.

A car that is subject to wheel wobble when driven over rough roads may show an absolute lack of wheel wobble when driven over a perfectly smooth roadbed. Where shimmying is present only when the vehicle is operated on uneven roadbed, it would indicate that those factors concerning the camber, castor and angle of the trunnion and steering arm would be the most likely causes. Pronounced shimmying on a smooth roadbed would indicate an out of balance condition of the front wheels, although, if the shimmying occurred on both smooth and rough roads, the remedy would be found only after a cut-and-try method of elimination. The history of the particular car should be of value in diagnosing and selecting the cure for wheel wobble. Knowing whether the car had been fitted with oversize wheels or tires, whether new springs, front or rear, had been installed, and knowing the recommended camber and castor specifications would be the main factors that would have a direct bearing on the decided remedy.

Reproduction of a blue print that is supplied chassis manufacturers by a prominent steering gear manufacturer is shown at Fig. 21. After the chassis man-

ufacturer has filled in the blank spaces on the print the gear manufacturer makes recommendations and possible corrections that would make for the best steering system layout for that particular chassis. It is believed that this print will be of some value to the service man, as it will enable him to supply the comprehensive data usually required by a gear manufacturer when his advice is sought on a problem of hard steering or wheel wobble. It will give the maintenance operator a guide for ready check on the points of the steering system that affect its performance.

High Ratio Steering Gears

Many of the causes of hard steering have a somewhat indirect relation with the problem of wheel wobble. To prevent the shimmying of the wheels being unpleasantly transmitted to the steering wheels, some manufacturers have brought about a condition that has been a compromise. They have eliminated the oscillation of the steering wheel by using higher steering gear reductions, which have given the necessary anti-wobble effect, although the maneuverability of the car has been compromised.

The dampening effect of tightly set king bolt bearings, which is a great help in keeping down the steering wheel's tendency to oscillate, caused a corresponding increase in the muscular effort required to turn the wheels, and at the same time retain a gear reduction that was low enough to give fast steering. Reductions as high as 12 to 1 are now being used, which require a considerably greater movement of the steering wheel for a corresponding movement of the road wheels than would be required by the 6 to 1 or 9 to 1 ratio.

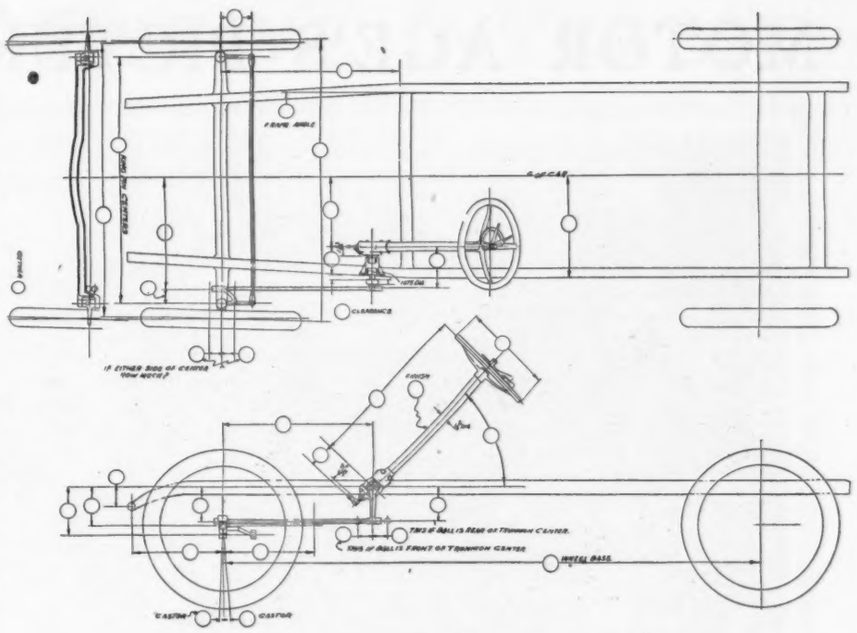


Fig. 21
Manufacturer's questionnaire blue print which covers details of chassis that affect operation of the steering gear

The high ratio means that the car will have a slower response to the will of the driver, although the greater irreversibility of the gear will further dampen the tendency of the steering wheel to oscillate if the car is subject to wheel wobble. Chronic hard steering, due to an improper chassis layout or inaccurate manufacture or assembly, has been a factor in causing the chassis manufacturer to choose the easiest way out of the trouble, which was by installing a higher reduction steering gear.

It is not unreasonable to expect that, when steering gear and front axle makers, together with the car manufacturer, combine the results of their experience, we will have easier steering cars, with the probable wider usage of thrust bearings in the spindle body head and at the same time the reduction ratio will be low enough that the maneuverability or rapidity of steering will not be compromised, nor will there be any tendency of the steering wheel to oscillate.

(Concluded)

23 Years Ago *This Week In* MOTOR AGE

(From MOTOR AGE of Nov. 14, 1899)

It Was Only Rumor

NEW YORK, Nov. 11—Rumors of an automobile trust have been afloat here this week. Those who are conversant with automobile manufacturing conditions, who realize the utter improbability of a consolidation of the various combinations now existing and who see the impossibility of a trust at least in this practically experimental stage of the industry, give scant attention to the rumors.

(This subject was further discussed and it appeared that the basis of the rumor was the incorporation in Delaware of the Anglo-American Vehicle Company with an authorized capital of $75,000,000. The new company was said to own 200 motor patents and to have acquired six British companies.)

Government Patronage

The French secretary of posts and telegraphs, M. Mougeot, is preparing to experiment with the automobile for the collection and delivery of mails. Similar experiments have been advocated by postmasters in the United States, and, in at least one case, successfully made. The time is probably not far distant when the governments of the world will be liberal patrons of the self-propelled vehicles.

Lessons in Satire

There is no escape from the fun and satire that is being and will continue to be poked at the motor vehicle industry. But the thinking man interested in the business can not infrequently find words of wisdom embedded in the flippant paragraphs. Under the caption, "Freak Machines," the Boston Advertiser says that a deal of money will go to waste.

"Until the manufacturers find out that the people generally do not want to ride in a vehicle that looks like an elephant on doughnuts, or one that leaves behind it an odor like an ink factory. The men who turn out light, graceful, odorless and noiseless machines will probably make plenty of money; and the others will eventually learn a good deal about popular taste."

The automobile assumed a new role in the election in New York. Isidor Cohn was a candidate for assemblyman and electrified his prospective constituents by utilizing an auto to travel over the district and from the steps of which he made political speeches.

MERCHANDISING PROFITS

It's easy to sell umbrellas on a rainy day. Everybody needs one in a hurry. Every car needs chains on a rainy day. When it rains the umbrella dealers hang out signs and display their umbrellas where they can be seen by the people who are passing. Why shouldn't the accessory dealer do the same thing?

At the first sign of rain get the chains out where they can be reached in a hurry. Put up a sign that drivers can see as they pass. Have the salesmen ask every customer who comes in, to buy. Make the rain sell a dozen pairs of chains for you and it will pay you a $15 profit. This is the way it looks in figures:

12 pr. of chains at $3.75—cost $45.

9 pr. of chains at $5—sell for $45. They pay for the stock.

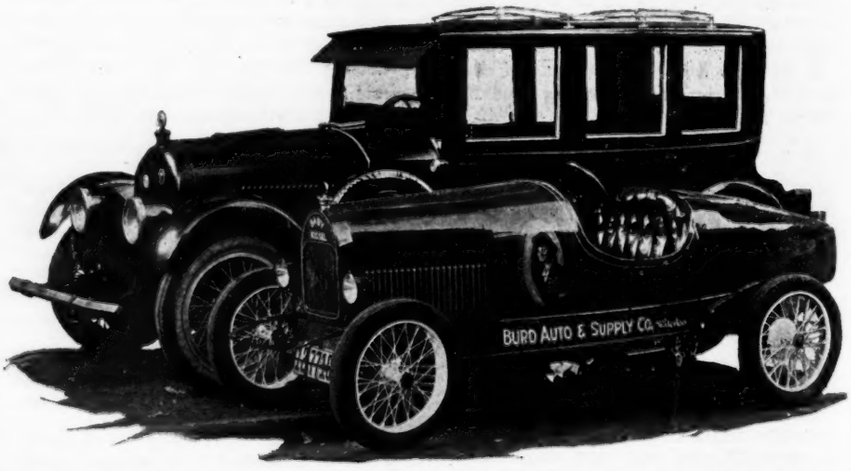
3 pr. of chains at $5—sell for $15. The last 3 pairs represent the "honey."

Tire chains are usually packed in barrels. How long will it take you to sell a whole barrel of chains? If it takes a year don't buy that many. Quick turnover is a fundamental of sound retailing. If your stock does not turn over three to four times a year, your capital is tied up too long.

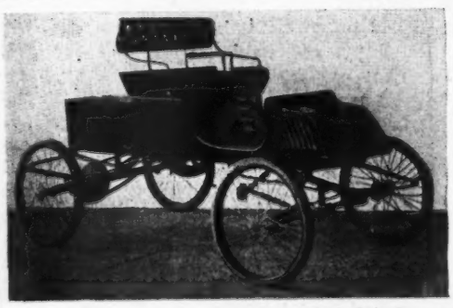
MOTOR AGE'S PICTURE PAGES

In wondrous Rio De Janeiro.—This beautiful South American City has recently been much in the public eye because of the opening of the Brazilian exposition. Folks from all parts of the world make special efforts to visit the city and enjoy not only the exposition itself, but also the city "Premiere Classe" of South America.

A Brazillian traffic cop



"A Baby Kissell" is the name which has been given to this dashing little car which the Burd Auto & Supply Co. of Waterloo, Ia. made in their shops. The wheelbase is 85 ins. 26 by 4 aeroplane wheels of 44 in. tread are used. It is equipped with a four cylinder engine, and is painted blue



Rambler Automobile is an ideal light touring car.

It weighs 900 pounds, has four full elliptic springs, exceptional driving power, safety starting device. Requires little attention; can be driven by a lady. Booklet G-T explains it fully; free on request.

THOMAS B. JEFFERY & CO.

Kenosha, - - - - Wisconsin

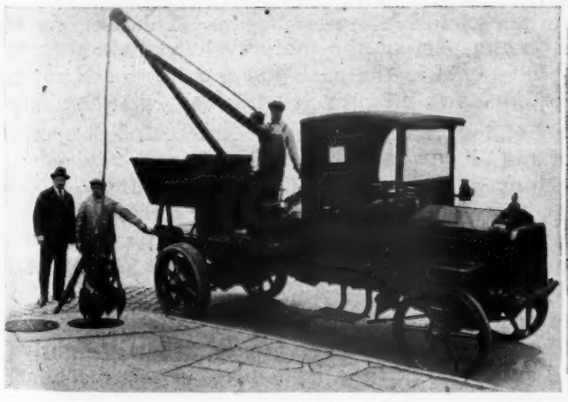
Getting back apace to view the ancient Rambler which was advertised by the Thomas B. Jeffery Co. of Kenosha, Wis. some 'steen years ago. The more one sees of the old-timers, the happier they are that they are zipping it up in the same business that has grown so wonderfully and advanced so thoroughly. And, too, to glimpse one of these affairs makes one wonder if perfection isn't just about reached in automobiles and still, who knows what someone will be saying about our "dandies" in another 20 years?

OF AUTOMOTIVE INTEREST

Diamond T trucks equipped for spreading asphalt paving. The tanks are made with heaters to keep asphalt in liquid state. The trucks are in use in Chicago where the R. F. Conway Co., street contractors, do work for the city

A prominent drug firm of St. Louis, Mo., has recently installed a number of trucks to take the place of sample trunks for salesmen. Now, instead of a salesman having to travel around the country on trains with an assortment of trunks containing samples, he is outfitted with a truck, the interior of which is fitted up with shelves for the display of his samples.

Chicago housewives are soon to be taught all the fine art of cooking by means of a spick and span shining truck with a miniature kitchen inside a dainty and efficient cook presiding therein, whose duty it will be to go from place to place and teach the housewives of the city how to cook better food. Mrs. Christine Frederick, National Food Expert is in charge of the new project.



In the city of Perth Amboy, N. J., according to the Street Commissioner, it costs on an average, $6.96 per basin, to clean sewers by the usual method of hand labor and teams. But P. J. Healey of New York City, has designed a machine which in the same city, does the work for $3.00 per basin

The machine consists of a Unit 50 Selden truck upon which is mounted an especially designed dumping body which may be removed allowing the truck to be used for other purposes. Upon the truck platform is a mast and boom, the mast resting upon ball bearings so that the boom may be swung directly over the catch-basin.

MOTOR AGE

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Safe Winter Driving Requires Clear Vision

CLEAR vision on the part of the dealer as well as the car owner is a factor in maintaining winter business, and displays of equipment designed to increase the safety of winter driving will not only boost the dealers' business but also prove beneficial to the industry as a whole.

Safe control of the car depends primarily on two things, the first of which is the ability to see the condition of surrounding traffic, while the second is the ability to make the car respond accordingly. The use of an automatically operating windshield cleaner which relieves the driver of the need of using one hand for this task is of vital importance to give clear vision in a storm, and the use of chains on the wheels is equally necessary to insure a quick stop when the emergency requires it.

Windshield wipers of several types are available, some of which are operated by the vacuum of the intake manifold while others are operated electrically. Some sweep a semi-circular portion of windshield, while others sweep nearly the entire upper glass. Among the electrically operated types, there is one that operates by means of two solenoids while another uses an electric motor and a continuous chain drive to move the wiper back and forth across the glass.

Whatever type or types the dealer handles, however, the question of reliability should of course be paramount, for the satisfactory operation will be remembered after the details of the sale are forgotten.

"Trust thyself, and another shall not betray thee."

Tourists

THE annual report of the superintendent of Yellowstone Park is quite illuminative of the development of the touring inclinations of the motor car owner. During the season just closed, 61,507 persons visited the park by motor car, going there in 18,253 cars. This is quite an increase over the previous year when 53,840 persons visited the park in 15,660 motor cars. In both years the motor car visitors were more than 60 per cent of the total number of visitors.

A tabulation of these cars was kept by states and it may be rather surprising to some persons to know that states east of the Mississippi river contributed a generous quota of the total. For instance: Illinois sent 202 cars; District of Columbia, 8; Florida, 12; Indiana, 94; Maine, 4; Massachusetts, 26; Michigan, 111; New York, 74; Pennsylvania, 54, and so it goes.

The idea of presenting these figures is to indicate the touring lust that is getting a strong hold on the motor car owner and to bring out the point that not all of the long drives are made by persons employed by manufacturers. Only a few years ago the fact that any owner of a motor car had driven from east of the Mississippi River to Yellowstone Park would have been a sensation, but now it is commonplace.

A consideration of these figures will assure any automotive dealer that the tourist business is something worth looking after.

"Drive thy business;—let not that drive thee."

Motorcycles

A MOTORCYCLE manufacturer is advertising in MOTOR AGE for automotive dealers to sell his products in communities where this factory does not maintain exclusive representation. This is quite a change on the part of the motorcycle manufacturers, as they have held in the past that a man, to sell their products, must be a motorcycle enthusiast, that he must be a part of the motorcycle crowd, interested in speed contests and all of the things that are associated with this machine in the ordinary layman's mind.

Now comes the effort to merchandise this wonderfully useful and economic machine as an individual, economic transportation unit. This factory has recently brought out a model of a motorcycle that is lighter than the speed demons, but which is entirely safe for the man who wants to cover great distances, lightly equipped and in quick time. The price of this machine is in proportion to weight rather than to its usefulness. It is a highly desirable transportation means to the man who travels alone and is not afraid of a bit of dust.

Selling motorcycles will be a novelty to most auto-

motive dealers but MOTOR AGE has always held that they should sell these machines. The display will not require much space, the service problems are not serious, the tire and other accessory business can be made profitable and altogether the proposition looks like "added income" to the automotive dealer who takes up this kindred line of merchandise.

"Distrust and caution are the parents of security."

Tires

THERE are, of course, two sides to the tire situation and the fault is not all with the tire manufacturer. One quite vigorous complaint of factory methods that has reached MOTOR AGE came from a tire dealer who sells, according to his own statement, "job lot" tires. Just why this man should be critical of the methods and manners of the tire manufacturers is not clear.

In selling "job lot" tires, he is assisting in the promotion of one of the greatest evils of the tire business and he is promoting the reputation of the tire business as being an undependable and unreliable business. Under present conditions of adjustments for tire service, the consumer always thinks that he is buying a fairly definite amount of transportation when he buys a tire. The dealer who sells a tire that is nameless, and which he cannot continue selling after a few hundred or thousand are sold, cannot possibly make adjustments, nor can he tell his customers that this tire is backed by a responsible house, for he cannot afford to back that tire himself.

This dealer is joining with the unworthy manufacturer in exploiting what should be one of the most responsible and reliable businesses in this country. There is much talk in business of the survival of the fittest and we believe that this applies more definitely and directly to the tire business than any other branch of trade. The units sold are quite costly and the trouble caused by a poorly made or unworthy tire is so out of proportion to the difference in cost, that the chance of survival by the unworthy manufacturer and dealer are practically nil.

Recently some entirely ethical tire associations have been formed and the dealers in these associations are trying to hew to the line of good business. If these associations will take the drastic step of expelling from membership dealers who violate trade ethics, they will soon get to the position where worthy manufacturers will be glad to talk with them and they will also get to the point where motorists will begin to know the difference between tires and fakes.

"Early to bed and early to rise, makes a man healthy, wealthy and wise."

Neglected Opportunities

WHILE it is true that the "free air" proposition is a sort everybody help themselves affair, it is equally true that institutions sponsoring these can, to a large extent, make them valuable business assets. Especially is this true, when we think of the free air privilege as a part of the dealer's business. Most gasoline filling stations have free air and water service and unless they sell accessories, also, they cannot hope to cash in as well as the motor car establishment.

All of which brings to mind a little affair which occurred recently. A motorist stopped in front of a dealer's place for gasoline. The man who attended the pump, looked very business like and did his work well so far as selling the fuel was concerned.

The motorist wanted air in a spare tire and asked the man if the air was working all right. The answer was "Yes, help yourself, right over there."

While the motorist was putting the air in his tire the man sat in front of his place and looked on. He committed no offense in doing this but, as long as he evidently had no other duties to perform could he not have offered to pump up the tire, with the thought that he might have observed the driver ought to have a spare tire cover? Or, maybe, he did not have an air pressure gage and what not?

Really, to have done this job of selling gasoline well, the man should have looked after filling the spare tire. There may have been a sale of some accessory. At least, the motorist would have appreciated the interest. He's going to buy gasoline there again, some day.

"All things are easy to industry, all things difficult to sloth."

A Dignified Business

SELLING automobiles is a dignified business, or it ought to be. Particularly in the smaller towns the automobile establishments of one kind and another nearly always outnumber the establishments devoted to any other line of business whatsoever. It is likewise the fact that in the aggregate the amount of capital invested in these establishments commonly is greater than the amount invested in any other line of business. Being therefore the most conspicuous business, it should be the most dignified and the cleanest, physically speaking.

The direct contrary is too often the case. Servicing and repairing automobiles always is dirty work at the best, but even so there is no reason why this inevitable service dirt should be allowed to smear up the whole works, as too frequently it is allowed to do. Of course, elaborate establishments are not common in small towns, nor are they expected to be there. The servicing of cars and the selling of cars are frequently in close juxtaposition, the dealer being compelled to function both as salesman and service man. Shirt sleeves and greasy jumpers cannot always be avoided therefore, but in a majority of cases some degree of cleanliness can be maintained in that portion of the establishment where the cars are displayed and sold.

There is absolutely no excuse for the dirt and disorderly appearance of too many small town automobile establishments. An automobile means comfort, utility and some degree of luxury, and to display it in the midst of dirty and slovenly surroundings detracts materially from all of these characteristics.

Generally speaking those small town concerns which enjoy the largest and most prosperous trade are those which are the cleanest. Those dealers who are not in this class and who wonder why the other fellow gets the business might practice a while with broom and mop to see if they can't find the answer.

Body Shortage Holds Up Production

Plants Curtail Output When Enclosed Types Grow Scarce

Condition Will Be Remedied With Completion of Body Factories

NEW YORK, Nov. 13—Although the major automobile producing plants have entered November with sufficient orders to justify production close to the high schedules of the earlier months of the year, they are being seriously hampered by inability to get enough bodies for the enclosed type of car, around which output now centers. Because of this scarcity, some makers, with orders far in advance, have found it necessary to curtail their program sharply. This situation probably will not recur once the additional body plants now under construction are in operation, but for the present it is the greatest obstacle to sustained production.

The demand for enclosed cars far exceeded the anticipations of the makers and found most of the body builders were not equipped to meet it. Orders are being taken care of as rapidly as the equipment permits with shipments regulated solely by the available transportation facilities.

Transportation Grows Serious

The transportation situation has grown more serious, enforcing the greater use of driveaways to deliver finished cars. This, however, has not brought relief to dealers at a distance from producing centers. Not only are freight cars scarce but congestion is great and locomotive power insufficient. A further aggravation is that fewer boats are available for shipments as the cold weather sweeps over the lake district.

The problem of the industry continues to revolve about the question of getting material and delivering cars and not so much around the question of sales. It is to be expected, however, that sales will drop off this month, but not to the level of last November when output was down to a figure approximating 120,000. The fact that November is a short month and includes a holiday will be a further reason for failure to reach the mark attained in October.

Recognition given the motor bus by municipal governments and railway executives has resulted in a pronounced increase in production of this type of vehicle. The truck industry, in general, while not making rapid strides, is going forward at a steady pace and bringing the production factories to a higher scale of operations.

The low mark in tire production for the year was reached during October, but production is increasing slightly and will continue to advance with the object in view of not only building up finished goods inventories but preparing for the spring demand. Advices from London on crude rubber restriction have allayed somewhat the fear that it will mean ultimately an increased cost of tires. Nevertheless, there is an undercurrent of feeling that with rubber output restricted and being quoted higher than heretofore and with advances made in the price of cotton used in tire fabric, the price of the finished tire must be affected.

N. A. C. C. Sends Out 20,000 Owner Questionnaires

NEW YORK, Nov. 13—J. C. Long, secretary of the educational committee of the National Automobile Chamber of Commerce, is sending out a questionnaire to 20,000 owners asking them concerning their next purchases. Long wants to know if they will buy an open or enclosed car and why their preference. It is expected that this will produce replies that will be of great help to manufacturers in trying to anticipate the body demands for the coming season.

PACKARD OFFICERS RE-ELECTED

DETROIT, Nov. 13—All Packard directors and officers were re-elected at the recent meeting of stockholders and directors. The stockholders' lists show 1,555 holders of common and 3,828 of preferred. In response to a question at the directors' meeting, President Macauley said the factory is running 200 cars behind orders and that even with production increased to 2,250 in December there is little likelihood of accumulating cars enough for spring demand. Seventy per cent of production today is enclosed cars, he said.

CHALMERS SALE SET FOR DEC. 7

DETROIT, Nov. 14—The plant and properties of the Chalmers Motor Corp. will be sold at receiver's sale on Dec. 7, under the terms of a final decree entered in Federal court Nov. 3 on the petition filed by Fisk Rubber Co., and the Metropolitan Trust Co. of New York, for the appointment of a receiver. William S. Sayres has been named special master to conduct the sale, the upset price on the entire property being fixed at $1,987,500.

OGREN INCREASES CAPITAL

MILWAUKEE, Wis., Nov. 13—An increase in authorized capitalization from $500,000 to $1,000,000 is one of the final steps taken by the Ogren Motor Car Co. of Milwaukee in a general reorganization program. The company was established about five years ago and manufactures the Ogren Six, a custom-built car at 692-704 National Avenue. Fred G. Smith, formerly of Cleveland, O., one of the original stockholders, has been made president and general manager.

Largest "Ask 'Em to Buy" Meet in Chicago Dec. 6

Jobbers' Committee Rents 5000 Capacity Hall for Big Event

CHICAGO, Nov. 10—Ten automotive supply jobbers of this city have combined to hold the largest "Ask 'Em to Buy" and "Shop Profits" meeting in the history of the Better Merchandising Campaign. The committee representing the jobbers has rented the Medinah Temple, which seats 5000 persons, for the night of Dec. 6. The promoters of the meeting confidently expect to fill the hall for that meeting.

The program will be a talk on "Better Merchandising and More Profits" by Ray Sherman, merchandising director of the Automotive Equipment Association, and the showing of the two films, "Ask 'Em to Buy" and "Shop Profits," which the merchandising committee has produced. A trailer film on "Electrical Trouble Shooting" by the American Bureau of Engineering, Inc., will also be shown. Pipe organ concert will precede the meeting.

The following jobbers are promoting this meeting:

Sheridan Auto Supply Co.
E. D. Kimball Co.
Universal Automotive Equipment Co.
Electric Appliance Co.
The Motor Supply Co.
Beckley-Ralston Co.
The Automobile Supply Co.
The Chicago Automotive Supply Co.
The Chicago Auto Equipment Co.
American Bureau of Engineering, Inc.

At a dinner on Thursday, attended by representatives of these firms, the following executive committee was appointed: H. Edsal Olson, chairman; J. C. Ralston and T. M. Brooks.

This will be the first opportunity for the Chicago retail dealers and their employes to see this film. All persons engaged in any branch of automotive retail distribution, will be invited.

SHIPMENTS BEHIND IN CALIFORNIA

LOS ANGELES, Nov. 9—The freight situation has become acute with automobile distributors in Southern California. Representatives of some of the most popular makes of cars are thirty days behind in deliveries of open models and sixty days behind in closed cars.

FIRST FRANKLIN SEDAN

SYRACUSE, N. Y., Nov. 13—Franklin Automobile Co. has a record of the first sedan built by that company and states that it is still in service. It was shipped Nov. 10, 1913 to Dallas, Tex., and was sold to G. A. Robertson, who operated it until June 3, 1922, when he sold it to S. A. Leake, an attorney.

C. A. Earl Resigns From Presidency of Earl Motors

V.-Pres. Scobie Takes Charge When Reorganization Is Demanded After Period of Inactivity

DETROIT, Nov. 13—The resignation of Clarence A. Earl as president and general manager of Earl Motors, Inc., formerly the Briscoe Motors Corp., Jackson, Mich., effective Oct. 31, has been accepted by the board of directors and preliminary steps to a reorganization of the personnel and finances of the company will be taken at a meeting of the board next week. Earl's resignation followed a period of plant inactivity extending back several months.

For some time past, the financial interests back of Earl Motors have been opposed to the continuance of Earl in the presidency and his resignation comes as a matter of no surprise to those familiar with the situation. Financing undertaken by Earl in the spring of 1922 was only partly completed and after a period of good business up to Sept. 1 the company again found itself in need of funds.

Company Producing 100 a Month

Since September the company has been operating on a basis approximating 100 cars a month, far below the output necessary to keep it on an earning basis. Attempts by Earl to raise support necessary to place the company in satisfactory earning position were fruitless with the bankers opposed to him. In this position there remained nothing for Earl to do but resign and the resignation was accepted at a meeting in New York in October.

Earl joined Briscoe in 1921 following his resignation as executive vice-president of Willys-Overland. The name of the company and of its product was changed in the fall to Earl Motors, making the Earl car. Taking over the company Earl faced the task of liquidating a heavy inventory which was practically wiped out this spring when the last of the Briscoe models were disposed of.

Cleared of Inventory

As it stands today, the company is cleared of inventory and has a good dealer organization but is short of working capital. With Earl out it is declared this will be provided and an entirely new organization put in to get the company on a strong operating basis by the first of the year. At that, operations are expected to be resumed on a major scale. George C. Scobie, treasurer, has been in Chicago during the week working with bankers on plans for the reorganization.

The troubles of Earl and the Earl company were augmented this spring by the fall of the Fort Dearborn Bank, Chicago, which had been the financial banker of the company, and instrumental in bringing Earl with the company. Following his resignation, Earl gave up his apartments in Jackson and with Mrs. Earl has gone to Virginia with Mr. and Mrs. W. R. Reynolds, where he will enjoy a several months' rest before undertaking a new connection in the industry.

Automotive Man Is Elected State Legislator

W. HOWARD METCALF

President of the Automobile Accessories Business Association of Philadelphia, Who Has Been Elected a State Representative

PHILADELPHIA, Nov. 13—W. Howard Metcalf, president for four successive years of the Automobile Accessories Business Association, was elected a member of the State House of Representatives from the Second County Legislative District.

Metcalf, who is a resident of Upper Darby, Delaware county, besides being president of the Automobile Accessories Business Association, has occupied the position of secretary of the Motor Truck Association of Philadelphia since its organization, or for eight successive years. He helped to form the Camden Automobile Trade Association, of Camden, N. J., and the Motor Truck Association, of Lancaster, Pa., and has numerous connections with leading clubs and fraternal organizations. He is manager in the Philadelphia territory for the Wire Wheel Corporation of America, with offices at 328 North Broad street.

Influential Member of Truck Association

As an influential member of the Motor Truck Association of Philadelphia, Metcalf took a prominent role a year ago in checking proposed regulations at Harrisburg that would have seriously crippled the truck industry and motor vehicle transportation and by untiring work with the legal committee of the association gained numerous advantages for the trade. All the automotive trades in Philadelphia are behind Metcalf in his plans to see that they shall have a fair show when new laws are framed at Harrisburg.

Higher Ethical Standard Is Aim of Iowa Dealers' Body

State Association at Des Moines Meeting Decides on Campaign for Unified Action

DES MOINES, Ia., Nov. 13—Iowa motor tradesmen will make a consistent campaign before the people of Iowa in the next year to emphasize the ethical standards of the automobile business. In its first annual convention held here Friday, the Iowa Automotive Merchants' Association, formerly the Iowa Motor Trades Bureau, gave particular stress to a higher standard of ethics in business. The association proposes to increase its membership to 5,000 by May, 1923. At present it has four all-time representatives in the field arousing the automotive dealers of Iowa to the need for stronger unified action.

Lee and Heller Speak

Gordon Lee, chief of the automotive division of the Bureau of Foreign and Domestic trade of the Department of Commerce, who made the principal address at the convention, emphasized the importance of strong state trade associations and told the dealers his department recognized the importance of organized effort as shown in the motor trades and hoped to shortly receive appropriations from Congress which would permit the same attention to domestic motor trades as it is now giving to foreign trade.

A. V. Comings, of Philadelphia, told the dealers what the Saginaw plan has meant to dealers there in actual profits on used car business and also explained the California associations emblem and its importance to member dealers.

Walter B. Heller, president of the W. E. Heller Finance Co. of Chicago, said that the automotive finance field was entirely separate from regular banking as it offered much more flexible arrangements and gave opportunity for creating business.

At its business session the association went on record as being strongly opposed to any attempt to introduce a lien law at the coming session of the Iowa legislature. Resolutions declaring for a strictly cash basis for all repairs and parts were unanimously adopted. The association will fight any attempt to repeal favorable sections of the present highway law and will defend many of the advantageous provisions of motor vehicles passed at the last session of the Iowa legislature which was fathered by the Iowa Motor Trades Bureau.

Opposed to Lien Law

Designs for an outside emblem to be displayed by members were adopted.

An active publicity campaign to acquaint people generally with high standards of conduct of the motor trades business is to be launched through means of high school contests, public

Truck Advertised 14 Years Ago Interests Farmer

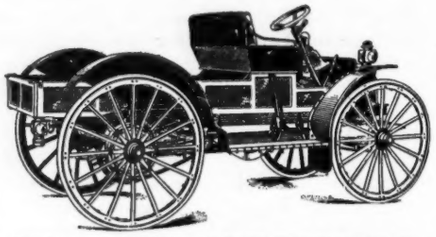
Wisconsin Man, Asking for Catalog of Pioneer "Auto-Buggy," Sends Clipping of Old Ad

CHICAGO, Nov. 10—An advertisement of the International Harvester Co.'s "auto buggy," published in a farm paper in 1908, has just brought a response from a northern Wisconsin farmer, who asked for a catalog. Under date of Nov. 5, 1922, the farmer wrote:

"Will you please send me a catalog of your auto buggy? I am sending you a picture of the auto buggy of which I would like a catalog."

Attached to the letter was a clipping of the advertisement which is reproduced herewith. The article described in this advertisement was the forerunner of the International Harvester Co.'s present line of International trucks ranging in size from 2000 to 10,000 pounds capacity.

This pioneer vehicle was powered with a two-cylinder air-cooled engine and was cranked at the side. The body followed the lines of the spring wagon, which was useful to the farmer both as a passenger vehicle and for hauling light loads of produce to market. The auto buggy was equipped with solid rubber tires and a removable rear seat was provided.



Service SERVICE is the first requirement of an auto-wagon. The International is built to travel city and country roads. It will go through mud, sand, or snow, climb hills, and in fact go places where a horse cannot take a buggy.

Economy ECONOMY comes next. The International costs less to operate than it costs to keep horses to do the same work.

Reliability RELIABILITY is another necessity. The International can be depended on to go and get back. It isn't out of commission when cold weather comes. It is air-cooled. It travels winter and summer, and if necessary, 24 hours a day.

Simplicity SIMPLICITY is an advantage. There is no intricate mechanism to get out of order; no complicated part to learn. Anyone can drive one.

Neat Appearance NEATNESS of appearance is not to be overlooked. With an International you are assured of satisfactory service at a low cost, of a dependable machine that is easy to operate, and the graceful lines and general neatness will appeal to any prospective buyer.

General Satisfaction

Ask the I H C local dealer for demonstration, or write direct for catalogue and further information to

International Harvester Company of America
(Incorporated)
CHICAGO U S A

New Series "Speedway Four" Announced by Stutz Company

INDIANAPOLIS, Nov. 14—Along with the bigger program of production and sales inaugurated under the new control of the Stutz Motor Car Co. comes the announcement of the Speedway Four, a new series which will succeed the KLDH series which the company has been making for a little more than a year.

No vital changes have been made in bringing out the Speedway Four, it being simply a bit more mature and refined than its forerunner.

Eight models are included in the line; seven-passenger touring car; four-passenger sporster; two-passenger roadster; de luxe bearcat roadster; seven and a four-passenger California type model; coupe, and five-passenger custom-built sport sedan. Prices on the Speedway Four models range from $2450 for the standard roadster to $4550 for the custom-built sport sedan.

The new model carries the same "D-H" engine as heretofore and as regards the other mechanical units of the chassis, no changes have been made.

(*Continued from page* 31)

speeches, stickers and cooperative advertising in local papers.

Dean Schooler of Des Moines, Oakland dealer and long time manager of the Des Moines show, was named president for the ensuing year; C. A. Morris, Cadillac dealer, Waterloo, vice-president, and George Darling, Franklin, Hudson & Essex of Marshalltown, treasurer. Fifteen directors, representing as many districts in the state also were named.

OIL PUMPING DISCUSSED

NEW YORK, Nov. 6—Oil pumping was discussed at a meeting at the Automobile Club of America last Thursday night which was attended by 80 service managers and dealers, the principal speakers being A. Ludlow Claydon of the Sun Oil Co. of Philadelphia, H. E. Pengilly of the Standard Oil Co. of New York, and George A. Round of the Vacuum Oil Co.

Discussing the pressure type of lubrication, Clayden told his audience that oil pumping troubles usually occur as wearing takes place in the bearings, being followed by an apparent drop in oil pressure. A remedy is to still further cut the supply of oil by opening the by-pass, said Clayden.

Round, talking splash lubrication, claimed faulty design of the connecting rod dippers and incorrect oil levels in the troughs often cause trouble, while Pengilly urged the service managers to make a special campaign to educate owners to change oil regularly. Pengilly condemned the practice of flushing out the crankcase with kerosene and told of a new flushing oil which has, he claims, all the advantages of kerosene without its detriments.

KING PRICES REDUCED

DETROIT, Nov. 13—Reductions of $300 on the open models, $200 on the coupe and $150 on the sedan are announced by the King Motor Car Co. The new list is as follows:

	Old Price	New Price
Roadster	$1795	$1495
5 pass. phaeton	1795	1495
4 pass sport	1795	1495
Coupe	2400	2200
Sedanette	1995	1995
Sedan, 7 pass.	2550	2550
Sedan, regular	2550	2400

Buying Tide in Pittsburgh Rising, Federal Reserve Says

Most of Demands Centering on Medium and Lower Priced Cars

PITTSBURGH, Nov. 16—The buying tide is rising in the Pittsburgh district, according to the monthly report of the Federal Reserve bank of the Fourth District, which includes Pittsburgh and Cleveland. Prices in general are showing an upward tendency.

Production of automobiles and trucks shows a decline. Quite a lot of the demand is centering on lower priced cars. There is an increasing demand for closed cars.

The better business situation has caused the demand for trucks to extend well into this time of the year. There is no particular change in the demand for heavy trucks, but light motor vehicles are in fair demand. These include those of 1½, 1, ¾ and ½-ton capacity.

Body Industry in Step

The body industry appears to be keeping in step with the general improvement. There is a very strong demand on the part of the public for closed car bodies, but there is an equally strong demand that closed car models be sold at a very little increase over the open car models. The principal reason why there is a shortage of closed models at this time is that motor car builders or body builders have not been able to figure out any way of building a more expensive model for approximately the price of the cheaper body that the public wants.

The storage battery business is reported to be very good with most of the large companies.

NEW SERIES 8 LOCOMOBILE

BRIDGEPORT, Conn., Nov. 13—Following reorganization of the Locomobile Co. of America, under the control of W. C. Durant, announcement is made of the new series 8 Locomobile. There is little change in the appearance of the new models, but several mechanical changes have been made. Dual battery ignition replaces magneto ignition, a new type of silent timing gear has been adopted and the suspension springs have been made more resilient than formerly. The chassis is priced at $6800, the phaeton at $7600 and the sedan at $11,000.

A. E. A. CONVENTION OPENS

CHICAGO, Nov. 13—The annual convention and exhibition of the Automotive Equipment Assn. opened at the Coliseum here today with more than 200 manufacturing members exhibiting their merchandise. At the first business session 18 new members were elected, five jobbers and 13 manufacturers. It was decided to hold the 1923 summer meeting at Dixville Notch, N. H.

Continued Activity in Tire Industry Assured for 1923

Federal Reserve Bank Reports Low Stocks and Continual Orders; Prices to Rise

CLEVELAND, O., Nov. 11—Commenting on the unusual activity in the tire industry this year, caused mainly, it believes, by increased touring and the many miles of new roads put into commission, the Federal Reserve Bank of this city says: "Dealers have operated with hand to mouth stocks, fearing more price reductions. There are few, if any, big dealers' stocks over the country and this means continual orders to the factories. The average size of orders is small but there are many of them.

"Many factories are now taking orders from dealers on a spring dating basis. The new terms have been presented to the dealers by most of the large tire compahies and this indicates the same policy of financing the dealer will be followed as in the past, but with changes in the general scheme. Some of the companies are preparing to make immediate shipments on spring dating orders and others plan to make shipments after Jan. 1. The price in some cases is being guaranteed against decline for six months. Other manufacturers are again following the trade acceptance plan. Practically all are serving notice on the dealers of a probable advance in tire prices in the near future."

Steady Enclosed Car Demand Taxes Body Shops' Capacity

MILWAUKEE, Wis., Nov. 13—Production schedules of passenger car manufacturers in this district not only are maintaining the October rate, but in most instances factories are finding it a struggle to make deliveries on enclosed car orders from distributors and dealers. The call for open cars has encountered some of the expected let-down which the late fall season always has brought, but it still is surprising how well this demand is being sustained.

Despite the acute railroad freight situation as it affects supplies of materials and shipment of finished products, it appears that the main problem of passenger car factories at this time is in the body shops. Enclosed bodies are at a higher premium right now than they were at any time this year. Provision being made by all factories and by the body concerns here have not reached the stage where appreciable relief has been effected. In most cases the additional facilities will not be available until after Jan. 1, because construction and equipment work was late in getting under way, inasmuch as the imperative need did not demonstrate itself until mid-year, or if it did, manufacturers delayed such undertakings until the new capacity would be occupied for a reasonable length of time.

NO FRANKLIN FOUR AT PRESENT

SYRACUSE, Nov. 16—Production of the new Franklin Four which was to sell for about $1,000 and be on the market next April, has been indefinitely postponed by action of the Board of Directors of the Franklin Automobile Co.

The rising cost of materials, which it is said, made it impossible to produce the car at the price intended, is the reason for the change in the plans of the company. The sale of additional stock has been discontinued.

The company also announced that it has discharged the force of 300 men which has been working at the experimental plant and only a few engineers will be retained.

The indications are that the new Franklin Four will not appear on the market at any time next year. Work on the proposed plant for the new machine has not been started, though the company has already purchased a large factory site east of the city. The plant for the six cylinder car will continue to operate at its present capacity.

Dealers' Used Car Manual Soon to Be Ready

NEW YORK, Nov. 9—A Manual of Used Car Cooperation, intended to assist dealer associations or groups of dealers desiring to work together for the profitable handling of used cars, will soon be ready for distribution to the trade. The manual is being compiled under the auspices of the National Association of Automobile Show and Association Managers, 239 West 39th Street, New York. It will be made available for dealer association secretaries and others desiring it at a nominal price covering the cost of compilation and publication.

Compilation of the manual was completed at a conference of the compilation committee, including Herbert Buckman, manager of the Cleveland Automobile Manufacturers' and Dealers' Association; L. B. Sanders, secretary of the Boston Used Car Statistical Bureau, and Neal B. Adair, editor of "Motor World" and executive secretary of the National Association of Automobile Show and Association Managers.

TWO ONE-LUNGERS RACE

BROCKTON, Mass., Nov. 17—A one-lung Cadillac and the same kind of an Oldsmobile, the forefathers of the cars that today bear their names and, like all other cars are models of speed and beauty recently ran a half mile race at the historic Brockton track here where 20 years ago, their owners would not be allowed inside the track.

However, the traditions of that day have been swept away by the steady march of the automobile and the two old-timers after tearing over a distance of half a mile at a speed of about 15 m.p.h., pulled up at the goal a dead tie for the honors.

Cleveland Association Will Discuss "Winter Business"

Merchandising Maintenance and Educating Owners to Receive Attention

CLEVELAND, Nov. 11—A new line of activity for service associations or service divisions of trade associations is to be undertaken in Cleveland. Winter merchandising of the maintenance departments will be taken up systematically by the service division of the Cleveland Automobile Manufacturers and Dealers' Association.

This division, consisting of the service executives of the dealers belonging to the Cleveland organization, meets every two weeks at the headquarters of the association. Many topics of mutual interest have been discussed, the men choosing their own subjects and chairmen for the respective meetings. They have chosen as the topic for the meeting of Nov. 14, "Winter Business." This is to be taken up from two angles: (1) bringing the cars into the service station, and (2) keeping them out of the service station. While this may sound somewhat paradoxical the men composing the Cleveland division seem to have it pretty well outlined.

In the first classification they expect to bring out as many ideas as possible for keeping up a steady supply of shop work during the winter months. Maintenance will be merchandised, and the service managers themselves are taking the initiative, instead of having it thrust upon them from some other branch of the institution.

The second angle "keeping the cars out of the service station" is addressed to the owners. They will be informed of the precautionary measures necessary for the preservation of the car in good running order during the winter months and incidentally sold preventive work and steps.

The Cleveland association is going at the discussion for the common good of all concerned. Shops will be kept busy and men steadily employed, business created for the concern, and the owner provided with satisfactory maintenance and operation.

De Palma to Enter Beverly Hills Race But Car Unknown

LOS ANGELES, Nov. 10—Considerable speculation has been aroused in Pacific Coast racing circles by the announcement that Ralph De Palma will drive in the annual, Thanksgiving Day, 250-mile classic on the Beverly Hills speedway. This is due to the fact that while making public the announcement of his intention, De Palma refused to divulge the identity of the car he will drive.

The entry list is limited to 20 and it is believed that number of cars undoubtedly will start.

First Annual Wyoming State Automobile Show Big Success

Display at Casper Marked by Novel Features and Large Repeat Attendance

DENVER, Nov. 10—Automotive distributors for the Rocky Mountain territory are highly elated over the attendance and sales results of the First Annual Wyoming State Automobile Show, held last week at Casper under auspices of the Casper Automobile Association and the Casper Daily Tribune. And Casper itself is as proud of this new proof of its prominence on the motor map as it is of the fame and wealth it has gained in recent years as center of an internationally-known oil field.

"Casper is the livest town of 25,000 people that I ever saw," began one report to the MOTOR AGE representative in Denver. "It has about 5,000 automobiles, including practically every make from a Ford to a Rolls-Royce. The show is proving a tremendous success, and the dealers are delighted because they are selling a large number of cars. This is the biggest event ever pulled off in Casper, and visitors are attending from all over the state, and also from Nebraska and Colorado points."

Exhibits Changed Every Day

Seventeen car dealers took part in the show, each having space for two cars. But those two cars didn't stand in their place all through the show in accordance with automotive show custom and tradition. Far from it. That is all right in Chicago or New York or any other city that takes motor shows as a matter of course; but not in pioneer Casper, where things have to be done differently. Each dealer changed his exhibit completely every day, thus being able to display all his different car models and at the same time treating the public to a new show every day. That this feature proved popular was shown by the heavy repeat attendance and by the favorable comments of visitors attending more than one program.

Another innovation was a system of having each car carry in the lower left-hand corner of the windshield a card six inches square, with the Casper-delivered price neatly marked thereon.

The show was held in the Arkeon Dance Hall, which was decorated with ferns and flowers, several hundred Japanese lanterns and a score or more of Japanese umbrellas, and with autumn leaves in such abundance that the ceiling looked like a wildwood bower. "The prettiest show I have ever seen," declared a Denver distributor who has seen many a show.

REPORT COMET ASSETS AS $461,000

DECATUR, Ill., Nov. 13—Assets of the Comet Automobile Company of this city, as given in the report of John W. Evans, master in chancery, in his report to the circuit court in the case of that company against the Farmers' State Bank and Trust Company, amount to $461,000 and the total ascertained liabilities, other than the $250,000 of bonds held as collateral security by the bank, are considered to be less than half the value of the assets. It is asserted in the report that irreparable injury would result to the company if the Farmers' bank should foreclose on the trust deed and sell the bonds.

Many Dealer Changes in Boston; Some Cars Dropped

BOSTON, Nov. 13—Changes continue to be recorded in the Boston motor district. The Mitchell-Lucas Co., distributor of the Mitchell for New England, has made an assignment for the benefit of its creditors.

Guy Piscopo, who organized the Lancia Motor Car Co. several months ago, closed his doors last week. He had expected to take over the distribution for the entire United States, and had one of the factory experts come here from the Lancia factory in Italy to look after his service department. But shipments were not coming through.

J. R. Miley, who had a large salesroom on Commonwealth avenue, specializing in used cars, also has gone out of business and accepted a position with the Marmon Boston Co. The changes in Boston, in fact, are more pronounced this year than ever, for here is the list of the last few months of men and cars that have either gone out of business or changed:

F. I. Rennert (King), Lally Brothers (Moon), F. E. Wing (Marmon), Ralph Nettleton-Perley Underhill (Cleveland-Chandler), Guy Piscopo (Lancia), J. W. Bowman (Daniels Eight), Connell-McKone Co. (Overland-Willys Knight), George W. Canterbury (Stevens-Duryea), James C. Tate (Holmes), A. L. Chandler (Liberty), Spencer-Reed Company (Kissel), Winton Motor Company (Winton), Middlesex Motors Co. (Monroe), Columbia Motors Company (Columbia), National Motor Car Co. (National and Earl), Elcar Motor Car Co. (Elcar), Sweeney & Thompson (Elgin).

Of this list Marmon, Moon, Cleveland, Chandler, Daniels, Overland, Willys-Knight, Stevens-Duryea, Liberty, Winton, Columbia, Kissel are again represented in Boston through factory connections or dealers. That leaves King, Lancia, Holmes, Monroe, Columbia, National, Earl, Elcar and Elgin out of the running. The Willys Overland bought out their distributors.

PACKARD ANNUAL REPORT

DETROIT, Nov. 16—Annual report of Packard Motor Car Co. today shows net profits for fiscal year of $2,115,828 on factory sales of $38,000,000. Noted that earnings were all in last six months, and that first six months' operations showed loss. Net current assets are shown seven and one-half times current liabilities. Total assets are five times total liabilities including company's outstanding bonds.

Better Times and Better Values Boost Texas Sales

Automotive Dealers Report Increased Business for October

DALLAS, Tex., Nov. 13—The automotive business generally, in Texas, has already gotten back to normalcy and is right now enjoying the best trade it has had in the past three years.

Dallas retailers are selling cars "like old times," they declare. It is not infrequent that the retailers in Dallas are far behind with deliveries. It is next to impossible to keep new cars in stock if salesmen make any pretense of moving them. Retailers said there had been more new cars sold in Dallas and the Dallas trade territory in the past 60 days than for any similar period in the past two years.

The increased sales in Texas are due to more money and better times generally. Another thing the dealers credit the increased sales to is the low prices for automobiles which are actually better machines than those manufactured three years ago. Still another reason for the increased sales, and by no means the least one, is real automobile salesmen are now selling cars. The automobile dealers of Dallas have ceased to employ hardware salesmen, shoe salesmen, plumbers and insurance agents as salesmen. They are employing automobile salesmen, pure and simple. These men are delivering the goods.

Used Car Sales Increase

Dealers also reported there had been a great increase in sales of used cars. There has been a wonderful increase in truck sales and in sales of tractors, trailers, accessories and tires during the past 30 days. The 10 day automobile show at the State Fair stimulated an interest which has not lagged so far.

Fort Worth, Amarillo, Wichita Falls, Abilene and Denison dealers reported increased sales for October. Houston, Galveston, Orange, Beaumont, Port Arthur and San Antonio said business in October was the best of the year.

Waco dealers staged a 15 day show at which everything in the line of automobiles and accessories was shown.

The next big show will be held at Houston. Then comes one at Beaumont and this will be followed by a ten day show at Fort Worth. These places are going to have the biggest shows they have ever staged this fall.

FIRST ENCLOSED CAR SHOW

HUNTINGTON, W. Va., Nov. 10—This city's first enclosed car show ended Nov. 4, having enjoyed a large and appreciative attendance. About 85 different models were displayed in the Vanity Fair building, a large exhibition hall. The place was beautifully decorated and music and dancing were provided each evening.

Detroit Dealers Hear How Stocks and Bonds Are Sold

Report of Association's Closed Car Show Is Satisfactory From Business Standpoint

DETROIT, Nov. 11—Detroit automobile dealers were given some first hand information on the sale of stocks and bonds at the monthly meeting of the association this week, by Charles A. Nyman, sales manager of the First National Co. of Detroit, as part of a series of talks on various forms of merchandising which Manager H. H. Shuart has arranged for the monthly get togethers.

A report on the closed car show just concluded showed that the association broke about even on the expense of holding it, and that it had resulted very satisfactorily from a business standpoint for dealers. Winter show plans were discussed but no definite action was taken on them, owing to the lack of a satisfactory building at this time.

Three new companies were elected to membership, the Marmon Detroit Co., Cunningham-Richards Co., and the Detroit Franklin Co. Application for membership from Pungs-Schmittdel Co. was received. Two changes in distributorships in the Detroit district were noted, Pungs-Schmittdel relinquishing a dealership of Studebaker to take on Stutz distribution, and Miller-Judd Co., changing from Liberty to Nash.

Nash Factory Has Shipped Over $20,000,000 Products

MILWAUKEE, Wis., Nov. 13—"More than $20,000,000 worth of products have been shipped out of the four-cylinder Nash passenger car works since this industry was established in Milwaukee less than three years ago," said Ben W. Twyman, general manager of the division, in a talk before the Tripoli Shriners' Luncheon club Friday noon. "Ground was broken just three years ago. Today we are rushing to completion additions which will double the original capacity. By March 1 we will be employing about 1,800 men, against 1,000 at present. In addition, there is being built adjacent to these works a new LaFayette plant, which will employ from 800 to 1,000 more.

"Our four-cylinder production now is at the rate of 75 cars a day, and yet we are not able to fill all demands promptly. You may ask, where do all these cars go? When one considers that the Nash organization embraces 2,000 or more dealers, in nearly every country on the globe, our present output means that each can get on the average of less than one car a month. It is a pretty poor dealer who can't sell that many—our Nash dealers are obliged to turn down several times that many cars each month due to our inability to make as many as they can sell. When we get to a schedule of 125 or 150 a day about March 1, it will mean that our 2,000 dealers will be able to get on an average of only two a month."

Ton of Coal Premium Helps to Sell Used Cars

HARTFORD, Conn., Nov. 13—The Britton Co., Stearns Knight distributor, adopted a unique method of moving used cars which was to the effect that for a period of ten days all purchasers of used cars would be given a ton of hard coal or the equivalent in cash. The offer was the more interesting for the reason hard coal has been at something of a premium in this vicinity for some time past. The firm put in a large stock of coal last spring and if every car listed was sold and each purchaser given a ton of coal the supply on hand would hardly be touched.

AUTOMOTIVE EMPLOYMENT GROWS

WASHINGTON, Nov. 11—Increased employment in the automotive industry has been noted by the United States Employment Service in its industrial analysis for the month ending Oct. 31. Under the industrial classification of "vehicles for land transportation" the industry which sustained a decrease last month of 16,232, shows an increase in October of 8,297 employes.

SCENIC BOULEVARDS FOR FRISCO

SAN FRANCISCO, Nov. 14—San Francisco's program for the construction of scenic boulevards, including six units totalling in cost $290,000 has been approved by the Board of Supervisors, and the money for it appropriated. Work on two of the highways is now under way, and the others will be started promptly.

SEES GOOD TRACTOR BUSINESS

CLEVELAND, Nov. 13—Every month in 1922 so far has shown a substantial increase in tractor sales over the corresponding months of 1921, declares the Cleveland Reserve Bank in its Monthly Business Review. Next year looks even better and production for 1923 is starting with schedules much larger than those of the last two years.

300 CHEVROLET DEALERS MEET

SAN FRANCISCO, Nov. 13—The Anderson-Smith Motor Co., distributors of Chevrolet cars, presented the 1923 models of this car with a convention of Chevrolet dealers at the Oakland plant, and at the distribution headquarters in San Francisco, which attracted nearly 300 dealers from every county in the state.

LOUIS E. ROOD DIES SUDDENLY

CHICAGO, Nov. 10—Louis E. Rood of Allison-Rood Co., Lincoln and Ford dealers in Chicago, died suddenly Nov. 3 of heart disease. Funeral services Nov. 6 were largely attended by members of the Chicago Automobile Trade Association.

A. A. A. Joins in Fight to Repeal U. S. Excise Taxes

Automobiles Going From State to State Are Ruled Inter-State Traffic

WASHINGTON, Nov. 11—Nation-wide reciprocity for motorists and the elimination of discriminatory war excise taxes against automobiles, trucks and automobile accessories will be the goal of the legislative activities of the American Automobile Association during the coming year, according to plans outlined by M. O. Eldridge, Executive Chairman of the A. A. A., and adopted by the Executive Board at a meeting held in Washington.

The Executive Chairman explained that the Supreme Court of the United States in two decisions, has ruled that automobiles traveling from one state to another are classed as interstate traffic and that under the Interstate Commerce Law Congress has a right to regulate such traffic. He called attention to the difference in automobile laws of the various states, some of which permit a visiting motorist only 30 days within their borders without purchasing a new tag while in others, the period runs as high as six months.

"In my opinion," said Mr. Eldridge, "there should be a national law authorizing a motorist who has paid for his license tags in his home state, and has complied with the laws of that state, to motor anywhere in the United States without paying additional fees."

Tractor Maintenance Courses Now Offered by University

MADISON, Wis., Nov. 13 — Three courses in the operation, care and maintenance of tractors will be conducted by the department of agricultural engineering of the University of Wisconsin at Madison. The first course opens Dec. 4, the second on Jan. 8, and the third on Jan. 29. Each class will be limited to 20 pupils and is open to any person, although tuition for residents of Wisconsin is free. Registration and laboratory fees for residents are $15, while non-residents pay $10.34 additional as tuition. The work is under the direction of F. W. Duffee, who initiated similar instruction a year ago with excellent results.

The daily program this year will consist of an hour's lecture followed by a three-hour laboratory period twice a day. Each course is identically the same, three being given to accommodate those desirous of attending at various periods of the winter. Prof. Duffee in a recent bulletin made suggestions to tractor owners to keep their machines busy during the winter. Grinding feed, sawing wood, hauling manure and shelling corn are some of the duties suggested for the tractor after the usual summer and early fall field work is completed.

Enclosed Car Sales Maintain Level of Retail Sales Trend

Used Cars a Serious Problem Despite New Low Level of Trade-in Allowances

MILWAUKEE, Wis., Nov. 13—A demand for enclosed cars which the majority of dealers are not able to meet promptly is keeping on a straight line the trend of retail sales, notwithstanding the decline in open car sales. Not all dealers are so fortunate as some, and reports concerning current demand are more conflicting, but in a general way trade is being sustained far above what had been expected for late fall.

Up to the close of the week temperatures in Milwaukee had not reached the point where motorists deemed it necessary to apply radiator and hood covers or inject anti-freezing solutions, although the appearance of metal radiator shutters increased. On the whole, it has been relatively moderate and produced a favorable effect upon selling.

The inability of certain dealers to get as many enclosed cars as they need to fill booked orders has diverted some business to other dealers who are in position to place cars in hands of customers upon sale. This makes the general aspect of business bright. The observer on the principal thoroughfare of Milwaukee notes that about three in every five new cars appearing on the street are enclosed types.

While allowances made by dealers on used cars are probably the lowest on record, a great many more are being offered than ever before and their disposition is a serious matter, due to the low prices at which new cars are selling. Ford dealers say they are encountering a flood of offers of used cars in the $1,000 to $1,800 price range and find it difficult to dispose of them even at or under allowance price.

Stutz Officials Find Sales Improved in Eastern Zone

INDIANAPOLIS, Nov. 10—President W. N. Thompson, and Sales Manager Fred Wilson, of the Stutz Motor Car Co. of America, Inc., have just returned from an extended tour of the Eastern Distributing zone, with enthusiastic reports of the activities of Stutz distributors and dealers in that section.

The results of the recent Closed Car Show in New York were most gratifying. In Philadelphia the S. R. Blocksom Motor Co. displayed greater activity at this season than during any previous year in its long connection with the Stutz company. A satisfactory amount of business on both open and enclosed models was reported, with every indication of continued activity throughout the winter months.

The Becker-Stutz Automobile Co. of Boston have increased their selling force to take advantage of improved conditions in the New England territory before the hard winter weather sets in.

Likewise, the Hoeveler-Stutz Co. of Pittsburgh, the Stutz Motor Co. of Cleveland, the Stutz Sales Co. of Baltimore, the Stutz Motor Sales Co. of Washington, L. S. Andrews of Providence and the Stutz Motor Sales Co. of Hartford report a very active demand, according to the Stutz officials.

Winter Embargoes on Truck Hauling in Maine

AUGUSTA, Me., Nov. 9—The Maine State Highway Commission has just served notice on owners of heavy trucks that there will be no hauling of heavy loads on the highways throughout the winter. At its meeting this week the matter was taken up, and it was announced that the commission felt that it was proper that it should put an embargo upon heavy traffic beginning on Nov. 15.

COMPILE RECORD OF ASSOCIATIONS

WASHINGTON, Nov. 13 — Alfred Reeves, General Manager of the National Automobile Chamber of Commerce, has been appointed a member of the general committee co-operating on trade association activities, by Secretary Hoover of the Department of Commerce.

Purpose of the committee is the compilation of a book on trade association activities embracing more than 4,500 trade associations, of which a large number are in the automotive industry. The work of the automobile industry, as embodied in the activities of the N. A. C. C., will be shown by Reeves, under whose supervision the chapter on the automobile industry is being written. The book will be printed about Jan. 1 and will carry a complete list of trade associations in America, with an explanation as to their scope.

AUTOCAR PRICES INCREASED

ARDMORE, Pa., Nov. 10—The Autocar Co. has announced a price increase on all truck models, to take effect Dec. 11. The new prices will be as follows:

	Old Price	New Price
Short wheelbase models—		
4 to 6 ton	$3950	$4200
2 to 3 ton	2950	3100
1½ to 2 ton	1950	2200
Long wheelbase models—		
4 to 6 ton	$4100	$4350
2 to 3 ton	3075	3200
1½ to 2 ton	2050	2300

RADIO AIDS DEALERS' MESSAGE

ST. LOUIS, Nov. 14—Reports received by the National Automobile Dealers' Assn. show that on the night of Oct. 12 the association's message on "Your Car and Your Dealer" was sent out from 57 radio broadcasting stations. It is estimated that several hundred thousands persons heard this address, the text of which was published in a recent issue of MOTOR AGE.

1923 French Grand Prix List of Rules Is Announced

Event Is Open to All Except Cars of Ex-Enemy Make; Fee 5000 Francs

PARIS, Nov. 10—A maximum piston displacement of 122 inches, a minimum weight of 1410 pounds without oil or gasoline, a tail limited to 49 inches beyond the rear axle, and a distance of 500 miles, are the main features of the official 1923 French Grand Prix rules just announced.

The event is open to all but ex-enemy nations, the number of cars per firm being five, and the entry fee 5000 francs per car, which must be filed before the end of the year. By paying double fees, entries can be placed with the Sporting Commission of the Automobile Club of France until February 29, 1923.

The French Grand Prix will be held on a road course during the first fortnight in July, the exact date to be selected after the course has been decided on. Candidates for the national French race are Lyons, which offers a subsidy of 300,000 francs; Strasbourg, which had the race last year; Touraine; and the district of Rambouillet, near Paris. A fuel consumption race will be held over the same course on the day following the 122 cubic inch speed contest.

Tire Casing Production Near Equalization by the Month

NEW YORK, Nov. 10—Production of pneumatic tire casings this year has been more nearly equalized by months than last year. The monthly production, including September, this year was between 2,055,134 in January and 2,905,209 in August. The low mark last year was 703,430 in January and the high mark was 3,043,17 in August.

Last September, with 2,504,744, showed a considerable decrease from the 2,905,209 of the preceding month, but was far ahead of September, 1921, when 1,929,268 were produced. Following are the comparative figures compiled by the Rubber Association of America for the Department of Commerce from the reports of the principal manufacturers:

	Inventory	Production	Shipments
1921—			
Jan.	5,319,605	703,430	965,417
Feb.	5,193,018	819,892	1,073,756
March	4,597,103	1,163,314	1,614,651
April	4,527,445	1,651,418	1,785,951
May	4,451,668	2,100,917	2,085,882
June	4,154,456	2,313,255	2,643,850
July	3,892,037	2,570,524	2,757,581
Aug.	3,934,853	3,043,187	2,894,442
Sept.	3,340,798	1,929,268	2,047,929
1922—			
Jan.	4,174,216	2,055,134	1,596,806
Feb.	4,691,329	2,084,308	1,562,365
March	5,183,286	2,645,790	2,073,963
April	5,464,336	2,401,187	2,086,651
May	5,523,095	2,721,503	2,639,273
June	5,042,147	2,838,890	3,133,260
July	4,834,106	2,476,636	2,695,095
Aug.	4,629,382	2,905,209	3,029,823
Sept.	4,612,037	2,504,744	2,502,106

Tractor Production for 1921 Is 74.1 Per Cent Under 1920

Census Shows 76,045 Machines Produced Last Year by 106 American Manufacturers

WASHINGTON, Nov. 11—There were 106 tractor manufacturing concerns in the United States in the calendar year of 1921, compared with 90 manufacturing concerns in 1920, exclusively engaged in the tractor and traction engine business, and not including steam tractors.

Last year, census figures show, these 106 gasoline, kerosene and distillate tractor manufacturers produced a total of 76,045 machines, having a value of $50,095,000. Of the total number produced, 915 were sold for export, having a value of $1,219,000.

During the previous year when there were 16 fewer manufacturers, there were 203,207 tractors and tractor engines built, having a value of $203,207,000, and of which 29,163 machines, valued at $30,850,000 were sold abroad.

Steam tractor manufacturers, numbering 12 in 1921, manufactured 957 machines, having a value of $2,293,000. In the year previous there were 15 manufacturers who produced 1766 machines having a value of $4,661,000.

Census figures, showing 1921 data on the sale and manufacture of farm equipment, shows that during that year there was a decrease of 42.1 per cent in the total value of the product, as compared with 1920. The largest percentages of decrease appeared in horse-drawn vehicles, amounting to 79.2 per cent, and in tractors and traction engines amounting to 74.1 per cent.

PROTEST WRONG USE OF CARS

ST. LOUIS, Nov. 12—The National Automobile Dealers' Assn., in a bulletin to secretaries of local dealers' associations, calls attention to the improper use of automobile freight cars by the various railroads and requests the local associations to appoint committees to protest to the railroads.

The railways are said to be very negligent in returning to the manufacturing centers the cars in which automobiles are shipped to dealers and distributors. They are said to be sending thousands of such cars into the South, West and Southwest and reloading them with cotton, lumber, sand, cement, flour and other commodities which could just as well be shipped in ordinary box cars.

TIRE FRAUD EXPOSED

A man claiming to represent a company known as the Springfield Tire & Rubber Co., of Springfield, Mo., has been defrauding garage men and tire dealers in Missouri, Arkansas, Kansas and Oklahoma. A garage proprietor at Lockesburg, Ark., wrote to MOTOR AGE that on Sept. 21, 1922, he gave this fraudulent salesman an order for six tires, paying a deposit of $6. The salesman gave a printed receipt bearing the name of the Springfield Tire & Rubber Co., which was represented as the manufacturer. The tires were priced very low. The salesman signed the name "Frank Clayton," but information received by MOTOR AGE is that he has used a number of other names. The Springfield Chamber of Commerce states that there is no such company as the Springfield Tire & Rubber Co. and that it is doing all in its power to expose this fraud, which it has learned has been practiced rather extensively.

"Y" Starts Mechanics Class for Women

FORT WAYNE, Ind., Nov. 11—The Y. W. C. A. of this city has started a class in automobile mechanics for women. The first half of the term is devoted to fundamental questions of design and operation and electric systems, carburetion and the cooling system, while the last half is devoted to the consideration of ordinary motor troubles and repair methods.

N. A. D. A. ASSISTANT MANAGER

ST. LOUIS, Nov. 13—R. O. Duffus has been appointed an assistant general manager of the National Automobile Dealers' Assn., further augmenting the association's field staff. He formerly was manager of the Packard branch at Kalamazoo, Mich., and later of the Lincoln sales department in the same city. He also was acting secretary of the Kalamazoo Automobile Dealers' Association. He will begin his service with the N. A. D. A. on Nov. 15, assisting at first in organization work in Indiana.

LICENSE INFORMATION SPEED

HARRISBURG, Pa., Nov. 10—Information concerning any Pennsylvania automobile license number may be obtained immediately at any time, day or night, by telephoning or telegraphing the State Highway Department at Harrisburg, under a new arrangement to maintain 24-hour service in the department. This information will be available to dealers in any part of the country to whom a car of doubtful ownership bearing a Pennsylvania license may be offered for sale.

DORT DETROIT SALES BRANCH

DETROIT, Mich., Nov. 10—Announcement of the establishment of direct factory sales and service in Detroit was made here last week by the Dort Motor Car Co. E. G. Poxson, former assistant general sales manager of the company, is managing the Detroit sales and service. The Dort sales rooms have been rejuvenated and the service department re-equipped. The seasonal opening was held with many factory executives present from Flint.

A Blacksmith Who Would Not Be Superintendent of Dort

Art Bickford Prefers Job With "Less Responsibility"; Sticks to Trade

DETROIT, Nov. 10—With J. Dallas Dort on a recent trip through Eastern cities to visit distributors of the Dort Motor Car Co., of which he is president, was Art Bickford, a blacksmith who might have been superintendent of the Dort factories, but who is happy to be a blacksmith still. Bickford was first associated with Dort 32 years ago and now works in one of his factories.

"Art's only a blacksmith," Dort said, "but he might have been superintendent of my plant many years ago if he had wanted to accept better positions as they were offered him. He preferred to remain a blacksmith, though, because he didn't want additional responsibilities, and," he asked, "what are you going to do with a man as happy as that?"

Of the trip Bickford said: "Mr. Dort was going east on a business trip and he knew I'd never been east, so he asked me if I wanted to go. It might be looked at as unusual to anyone who doesn't know Mr. Dort. He's always like that. He's always doing something for the boys. This time it happened to be me."

Bickford received $1950 of the undivided profits of the Durant-Dort Carriage Co. in 1917, when it became the Dort Motor Car Co. He was one of many employes receiving a reward for long service.

MOON SALES INCREASE IS GREAT

ST. LOUIS, Nov. 14—The Moon Motor Car Co. reports that its sales for October were 390 per cent greater than sales for October of last year and were 70 per cent of the sales for last August, which was the largest month in the company's history. The dropping off of business in some sections of the country has been to a large extent compensated for by an increase in other sections, notably in Texas and California. The November production schedule calls for the same output as in October.

PIEDMONT SOLD AT AUCTION

LYNCHBURG, Va., Nov. 14—The plant of the Piedmont Motor Car Co. has been sold at auction under a deed of trust and was bought in by the First National Bank of Lynchburg, beneficiary. A. Leslie Stephens of Lynchburg is in charge of the property for the bank and is endeavoring to find a private purchaser for the plant.

FRANKLIN UNFILLED ORDERS

SYRACUSE, N. Y., Nov. 10—The Franklin Automobile Co. reports that the number of unfilled orders now on hand is equivalent to all of November production and one-third of December production as well. Some types are sold more than two months ahead.

A. E. A. Meeting Attendance Shows Remarkable Growth

"Ask 'Em to Buy" Movement Increased Jobbers' Sales 50 to 600 Per Cent

CHICAGO, Nov. 13—Remarkable growth of the merchandising campaign of the Automotive Equipment Assn. is shown by a comparison of the number of meetings and attendance last year and this year. The 1921 campaign got actively under way about Aug. 1, and from that date to the first week in November, 37 meetings were held, attended by 1875 people. From Aug. 1 this year to the first week in November, 129 meetings were held and the attendance was 10,757. At the 1921 meeting the moving picture entitled "Ask 'Em to Buy" was exhibited. This year a new film entitled "Shop Profits" was prepared and at many meetings both picture was exhibited.

Have Been Active

Several automotive jobbing and manufacturing firms have been active in arranging and conducting meetings this fall. George A. Brush, representing Ozburn-Abston & Co. of Memphis, held 26 meetings at which the attendance was 948. Midwest Auto Supply Co., Dubuque, Ia., held nine meetings. McCauley-Ward Motor Supply Co., Waco, Tex., held 32 meetings with an attendance of 956. Black & Decker Mfg. Co. held 19 meetings with an attendance of 1977. L. A. Cavanaugh of the Motor Car Supply Co., Calgary, Canada, held 14 meetings attended by 500 persons.

Two Pacific Coast jobbers recently gave the Merchandising Committee figures representing the increase in business in certain lines which they attribute to the "Ask 'Em to Buy" movement. One company noted the following increases in one year in the lines designated: Motometer, 50 per cent; fan belts, 100 per cent; bumpers, 125 per cent; spotlights, 200 per cent. Increases noted by the other company were: Fan belts, 100 per cent; motometers, 103 per cent; bumpers, 78 per cent; stop signals, 600 per cent; brake lining, 40 per cent; spotlights, 100 per cent. There were increases in other lines, but these were taken as typical.

Dealers Band Together to Lease Storage Warehouse

MILWAUKEE, Wis., Nov. 11—Plans for the organization of a bonded warehousing corporation that will be responsible for the storing of more than $1,000,000 worth of motor vehicles during the winter months are under consideration by the automotive division of the Association of Commerce of Green Bay, Wis. The dealers of Green Bay and vicinity again are confronted by the problem of adequate and controllable warehouse space for new car stocks during the slack selling session from the end of November to the end of March, when the most severe weather of the winter usually comes.

It is planned to lease the main exposition building of the Brown county Fair Grounds as a warehouse. Practically all dealers would become stockholders in the bonded warehousing corporation, which would provide proper guards, insurance and other requirements. The building has 30,000 sq. ft. of floor space, is weatherproof and ideal for storing motor vehicles. It was erected two years ago at a cost of $18,000 by the automotive division to provide an adequate hall for displaying automotive merchandise. The division is paying for the building out of the profits of the annual county fair motor show. About $5,300 was paid off in 1921 and $4,700 this year, leaving $8,000 to be absorbed by the 1923 and 1924 shows.

At present there is no bonded warehouse nearer than Milwaukee. It is planned to enter other fields besides motor vehicles later. The exposition hall is used only one or two weeks each year for motor show purposes and the new plan will keep it working the other fifty or fifty-one weeks.

Dealers in Illinois Work for U. S. Tax Repeal

PEORIA, Ill., Nov. 10—The Illinois Automobile Trade Assn. has taken active steps to cooperate with the National Automobile Chamber of Commerce and the National Automobile Dealers' Assn. in the campaign for the removal of the Federal excise war taxes on automobiles and automotive products.

A letter has gone out from the office of the association to all members requesting them to communicate with the candidates for Congres in their respective districts and determine their attiude on the repeal of these taxes.

MIDWEST RUBBER MEETING

CHICAGO, Nov. 10—Official notice that the November meeting of the Midwest Rubber Manufacturers' Assn. will be held in St. Louis Nov. 14 has been sent out by the secretary. The meeting place will be the Missouri Athletic Assn. and arrangements are in charge of a committee of which the chairman is F .W. Knoke of the American Zinc & Lead Smelting Co.

BOSTON CADILLAC FORCES MEET

BOSTON, Nov. 9—Verne E. Burnett, advertising manager of the Cadillac Motor Car Co. of Detroit, was the speaker at a meeting of the sales force and suburban dealers identified with the Cadillac Motor Car Co. of Boston here. President A. L. Danforth introduced him to the audience, and he outlined the policy of the Cadillac company as planned for the coming year.

"Bootlegger Insurance" to Protect Dealers in Oregon

Policies Cover Loss of Time Payments on Cars Caught Transporting Liquor

PORTLAND, Ore., Nov. 13—Bootlegger insurance, surety to protect the automobile dealer's interest in the car sold to unknown parties on the credit plan, is now a regular thing in Portland, as a result of activities of the prohibition director's forces in Oregon recently. Not only are practically all of the automobile insurance companies issuing the bootlegger policies, but the automobile dealers are taking out the policies to protect their interests in cars sold on part payment down. Some of the dealers are taking such policies on all cars sold on installment, even when they know the purchaser.

Some Experiences

In several cases in Oregon lately owners of machines which have been stolen have had great difficulty in getting back their machines after they have been found by government agents in the hands of bootleggers and carrying cargoes of liquor. Government agents also are shutting down tight on the old plan which has been in vogue of one man loaning his car to another, without knowledge, according to his claims, that the borrower was going to use the car for transporting liquor. The car-for-hire-without-driver business has also become considerably curtailed.

"The automobile dealers cannot afford to take any chances in selling a car," said Ralph Staehli, secretary of the Automobile Dealers' Association of Portland, in explaining the new stand. "There is an element of risk in all time contracts, under the conditions, and if there is the least suspicion in the mind of the dealer that the car he is selling may be used to transport liquor, it is cash and a full payment for the car."

Trade Association Approves a Law to License Mechanics

OAKLAND, Cal., Nov. 13—After an exhaustive investigation covering several months, a special committee appointed by the Garage and Repairmen's division of the Alameda County Automobile Trade Association has reported in favor of a law licensing automobile mechanics. While many of the members of the Alameda county branch, and of the California Automobile Trade Association, the parent organization, are not in favor of this law, yet the expression of majority opinion at the recent state convention in Santa Barbara was in favor of some system to elevate the standard of automotive mechanics.

The Alameda County Automobile Association appointed H. P. Wellman, J. W. Bakke, D. F. Bacheller and G. A. Robinson acommittee to investigate.

CONCERNING MEN YOU KNOW

J. F. Hartz, who has been president of the C. M. Hall Lamp Co., of Detroit and Kenosha, for the past 12 years has resigned this office and accepted that of chairman of the board of directors. W. F. Anklam, secretary and general manager for the past 12 years, has been elected president and general manager in recognition of the manner in which he has conducted the affairs of the company.

Karl O. Schreiber, who has been assistant superintendent of the Springfield, O., works of the International Harvester Co. for the last two years, and prior to that general assistant to the president, is now director of factory operations at the plant of the Westcott Motor Car Co.

M. R. Himes, manager of the United Garage Co., Toledo Reo dealers, has resigned and will be succeeded by W. F. Hoy. Himes has been confined to his bed due to serious illness for several weeks.

Lynn Whaley, former Acason dealer in Toledo, has been appointed to take charge of the wholesale territory covering 27 counties around Toledo for the Transport Utilitor Sales Co., of which K. G. Mengert, formerly with Packard, has been named general manager.

Edward Taylor, formerly in charge of sales in the west central states for Transport trucks, has resigned to take a similar position with the Stewart Motor Truck Corp. with practically the same territory. His headquarters are at Cleveland and the territory takes in Ohio, Indiana, West Virginia, Kentucky and parts of Illinois.

Charles B. Wilson, former vice-president and general manager of the Willys-Overland Co., who resigned two weeks ago to make way for President John N. Willys to take charge of the plant, has gone to Pasadena, Cal., to visit a brother before returning to his extensive interests at Pontiac, Mich.

The officers and employes of the Stockell Motor Car Co., Nashville, banquetted A. W. Davis and presented him a handsome mahogany clock on his leave taken after six years with them to go with the Chevrolet Nashville Co., as manager, to conduct Chevrolet sales and service exclusively.

A handsome silver tea and chocolate set was presented to Henry W. Osoinach at a meeting of the Memphis Automobile Association, when his resignation as secretary was accepted at a recent meeting. Osoinach becomes general agent of the Continental Life Insurance Co.

Thomas R. Brown, Jr., formerly office manager of the Howe Rubber Corp., New York, has been appointed New York district manager with headquarters at 232 W. 58th Street, New York City.

George L. Bitting, sales manager of the Eaton Axle Co. since its organization, has taken over the salesmanagership of the Standard Welding Co. of Cleveland. Both companies are divisions of the Standard Parts Co. of that city. P. T. Hill succeeds his former chief as salesmanager of the Eaton Axle Co. Hill also has been with the Axle Co. since its organization and previous to that was connected with the Torbensen Axle Co.

F. E. Titus, who for the past several years has been director of sales of the International B. F. Goodrich Co., has been elected to second vice-president of this company. Titus at one time was manager of the Buffalo and Pittsburgh branches. He was later transferred to the foreign sales department with headquarters in New York, and then was brought into Akron to take full charge of the company's foreign sales.

James A. Muir has severed his connection with the Corcoran-Victor Co. of Cincinnati and associated himself with C. M. Hall Lamp Co., of Kenosha, Wis., caring for the jobbing trade.

J. C. Anderson, who has been secretary and general manager of the Lahr Motor Sales Co., Bismarck, N. D., for the last six years, has retired to engage in other business, the nature of which is not announced.

John D. Carmody, formerly a territory manager for the Champion Spark Plug Co., and more recently a district manager of the Wainwright Engineering Co., has been appointed middle-western manager for the Columbus McKinnon Chain Co., of Columbus, Ohio, manufacturers of Dreadnaught tire chains. He will have his headquarters in Chicago and will cover the following states: Illinois, Iowa, Missouri, Minnesota, Wisconsin, Kansas, Nebraska, North and South Dakota.

T. J. Turley, formerly implement jobber and dealer of Owensboro, Ky., has become associated with the J. I. Case Plow Works Co. as division manager of the southeast division.

President Ansley H. Fox of the Fox Motor Car Co., Philadelphia, announces the personnel of his organization as follows: General superintendent and factory manager, William K. Swigert, formerly of Marmon and for seven years Chalmers superintendent; chief engineer, Paul F. Hackethal, formerly with Mercer, Templar and Buick; purchasing agent, C. H. Lindsittel, formerly with Haynes, Templar and Garford and Duesenberg; assistant superintendent, J. H. Kreidler, formerly with Hudson, Northway Motors, Steering Gear and Parts Co., and the Gear Grinding Machine Co.; general sales manager, Fred C. Vanderhoof, formerly with the Standard Steel Car Co. and before that general manager of the Philadelphia Ford plant.

Franklin A. Miller, formerly advertising manager of Stromberg Motor Devices Co., has joined the staff of the Dunlap-Ward Advertising Co., Cleveland, and will have charge of promotion work. For the past three years Miller headed his own company merchandising automotive parts and accessories.

H. M. Jerome, formerly sales manager of the B. L. Schmidt Co., of Davenport, Ia., has purchased the Norman Piston Ring Corp., of Peoria Heights, Ill., and will erect a factory at Battendorf, near Davenport. He will be president of the new company. The company manufactures the Norman piston ring.

Cyrus McCormick, Jr., has been elected a vice-president of the International Harvester Co., and given charge of the company's manufacturing plants in the United States, Canada and Europe. He is a son of the chairman of the company's board of directors and since 1919 has been works manager in charge of plants at Chicago, Milwaukee, Akron and Springfield, O. Vice-President H. F. Perkins has been assigned to assist the president and act as president in his absence.

Walter H. Woods has been appointed sales engineer of the motor bearings division of Hyatt Roller Bearings Co. in the Detroit district. He has been connected with Hyatt in engineering and sales capacities for four years in several parts of the country.

F. J. Wildes, formerly with the E. W. Clark Motor Co., Milwaukee, Wis., distributor of the Maxwell and Chalmers, has been appointed retail sales manager of the Chidester-Frint Co., Milwaukee, state distributor of the Durant and Star. He will supervise sales in Milwaukee city and county.

Emmet V. Pollard, of the sales organization of the General Tire & Rubber Co., who has been a special representative in New York territory for some time past, has been transferred to Texas, where he will be manager of the Dallas branch of the company.

Banker Predicts Demand for Motor Vehicles Will Continue

BOSTON, Nov. 11—In an address before the Harvard University Committee on Economic Research, Leonard P. Ayers, vice-president of the Cleveland Trust Co., predicted that automobile output next year would be as great or greater than this year. He said there had been a real shortage of motor vehicles this year and that there are no indications that the demand will be reduced next year.

GASOLINE TAX PROPOSED

RICHMOND, Va., Nov. 9—Resolutions calling upon Governor Trinkle to convene the General Assembly in special session to adopt legislation for a $12,000,000 bond issue to be floated through a gasoline tax were unanimously adopted by the Richmond Automobile Club, 1,200 strong, at a session held in Richmond Hotel this week. George Diehl, president of the American Automobile Assn., was a speaker. The resolutions adopted will be forwarded to the governor with a demand that the legislature be called at the earliest possible moment.

Week of Nov. 5 Is Dort Car Dealers' "Introductory Week"

Many Factory Officials Visit Distributing Points Throughout Country

FLINT, Mich., Nov. 12—The week of Nov. 5 was "Introductory Week" for the Dort Motor Car Co., and executives from Flint visited scores of distributing points for the purpose of establishing personal contact with distributors and dealers the country over.

J. Dallas Dort, president of the company, visited distributors in Detroit, Buffalo, Boston, New York, Philadelphia and Pittsburgh.

John D. Mansfield, general sales manager of the company, went to Chicago, Milwaukee, Minneapolis, Omaha, St. Louis and Cincinnati.

Wesley Buck, sales engineer, was in Chicago, Omaha, Salt Lake City and Los Angeles. He will visit distributors and dealers in San Francisco, Portland and Spokane.

Other executives had itineraries which carried them to all parts of the country. Each distributor invited dealers to meet the factory representatives. So almost the entire sales organization of Dort was in personal contact with the factory during "Introductory Week."

WILLYS TALKS "HUMBLE PIE"

TOLEDO, O., Nov. 9—John N. Willys, who has recently returned to active work at the Willys-Overland plant in Toledo as general manager, told a large group of Toledo business men that he believed he had consumed all the "humble pie" supply in the last three years. He had read a sign on his church home here to the effect that "humble pie is nutritious." Willys said all was well at the big plant and that he wasn't making any promises. He complimented C. B. Wilson on the fine organization which he left at the plant when he resigned as general manager.

DEALERS ELECT MENDENHALL

SALT LAKE CITY, Utah, Nov. 10—The County Automotive Trades Assn. has elected B. W. Mendenhall of the Mendenhall Auto Parts Co. as chairman to fill the vacancy brought about by the resignation of V. A. Culver of the Motor Mercantile Co. M. L. Graham was chosen vice-president.

FLETCHER MAY HEAD MASS. DEPT.

BOSTON, Nov. 11—There is a movement on foot to secure Austin B. Fletcher, who has been constructing the highway system for the state of California for a number of years, to come to Massachusetts and take the place left vacant by the death of the late John N. Cole, chairman of the Department of Public Works.

IN THE RETAIL FIELD

W. O. Harlow, Oakland and Republic truck distributor in southwestern Michigan, has taken over the building formerly occupied by the Stevens-Buick Sales Co. and is completely rebuilding the structure. He has installed a new plate glass front and greatly enlarged the showroom, which now occupies two floors. Under one roof he has one of the most complete sales establishments and repair shops in this section of Michigan.

The Kalamazoo Implement Co., Otis J. Boylan, proprietor, handling the Reo line, has bought out the Kalamazoo Auto Exchange, Nash agency, and will occupy that establishment with a used car department. R. J. Bixler, former proprietor of the Kalamazoo Auto Exchange, and W. J. Davidson, will have charge of this department in the future. Mr. Bixler is one of the most remarkable used car salesmen in the state. During the extreme dull times of 1921, from January 1 to October 1, he sold in that period of nine months 366 used cars.

J. F. Nolan, president of the Philadelphia Roamer Co., North Broad Street, has been appointed distributor of the new Barley car.

Columbia-Kissel Motor Co. has been formed at Philadelphia to take on the distribution of the Columbia Six and the Kissel car lines, which will be handled from 250 North Broad Street.

Harper & Harper, distributors at Philadelphia for Hupmobiles and Handley-Knight cars, have opened their new headquarters in a four-story structure at the southwest corner of North Broad and Brown Streets.

L. E. Shepherd and Odes Lard have taken over the Ford car agency in Carlinville, Ill.

Illinois Auto Supply Co., 449 North Water Street, Decatur, Ill., has been appointed territory agent for the Durant Motor Co. and has the new Star car on its sales floor.

E. D. Horrell, Galesburg, Ill., has been appointed agent for the Stutz car in this territory. He recently drove a car from Indianapolis for demonstration purposes.

The Parsons-Reynolds Co., tire dealer, Springfield, Mass., has been petitioned into bankruptcy.

The Minott Garage, Greenfield, Mass., hitherto run by Charles H. Minott, Waltham dealer, has been leased by Tirrell & Gilmore and will be conducted as sales and service headquarters for the Hudson and Essex.

Stutz-Graves Motor Co., 1223 Broadway, Nashville, Tenn., is now distributors for ceneral Tennessee and southern Kentucky of the Cleveland Six, showing tourings cars, sedans and various models at their showrooms.

Universal Motor Car Co., of Memphis, Tenn., Jas. M. Walker, president, will shortly occupy its new home now being completed at a cost of $50,000 on Jefferson Avenue near Fourth Street, in the very center of the downtown district.

The 416 Tire Co., Memphis, Tenn., has moved into its new $25,000 building at 935 Union Ave.

W. E. Stalnaker and A. S. Johnson have purchased the franchise for the Earl car in Chicago and surrounding territory from the Brown Moriarty Co., 2634 S. Michigan Ave., Chicago.

Murray Page has been appointed to succeed W. S. Porter as manager of the Chicago branch of the Locomobile Co., on Michigan Ave. near Twenty-third St.

Frank E. Witt has been appointed assistant general manager of the W. C. Auble Motor Car Co., Chicago, Durant and Star agency. He was formerly sales manager.

The Valley Motor Car Co., of Menasha, Wis., has disposed of its branch sales and service business, including the Studebaker franchise, to R. F. Ware, who has been in charge of the branch as manager since it was established.

Knaack & Priebe, Ford dealers, Princeton, Wis., have dissolved partnership, and the business will be continued by E. L. Priebe as sole owner.

Cameron Motor Car Co., 127 South Sixth St., LaCrosse, Wis., has let contracts for the erection of a $20,000 sales and service building.

Mayer Buick Co., Kaukauna, Wis., is a new $10,000 corporation organized to act as Buick dealer and conduct a general service station.

J. Sagerstrom, Buick dealer, Rhinelander, Wis., has admitted Peter P. Dandoneau as a partner and the firm name of Sagerstrom-Dandoneau Motor Co. has been adopted. A new sales and service building costing $35,000 is under construction.

The Korbel Motor Car Co., Town of Lake, Milwaukee county, Wis., has been incorporated with $10,000 capital to deal in new and used cars and conduct a garage business.

West End Auto Repair Co., Madison, Wis., is a $6,000 corporation formed by M. H. Delaney, E. H. Crary and others to conduct a general automotive repair and service shop.

Zemke & Pake, Prairie du Chien, Wis., for several years Harley-Davison motorcycle dealers, have been appointed Durant and Star dealers and on Nov. 1 opened in new sales and service headquarters in the Garrity building.

Brown County Motors, Inc., Green Bay, Wis., Hudson and Essex dealer, has started work on a new sales and service building, 55 by 165 ft., at 600-604 Main Street, to be ready Feb. 1.

Durant Motor Car Co., Wausau, Wis., has let contracts for the erection of a headquarters building at 208 Washington Street, estimated to cost $30,000.

James M. Malone has been appointed sales manager of R. C. Cook Co., Chicago distributor of Velie, King and Fiat.

Chicago Avenue Commercial Auto Body & Wagon Works, Inc., 800 N. Albany Ave., Chicago, has been incorporated for $7,500 to manufacture and deal in motor vehicle bodies, wagons, etc.

Motor Dealers Supply Co., 1520 S. Wabash Ave., Chicago, has been incorporated for $15,000 to manufacture and deal in automobiles, accessories, etc.

Dealer Using Flat Rate Offers Year's Maintenance for $25

DETROIT, Nov. 11—Simons Sales Co., distributor of Willys-Overland cars for Michigan, is offering a year's upkeep on any new Overland car, bought from this time on, for $25. The offer includes labor and all parts and equipment except tires and batteries, and also excepts damages due to wrecks. The new offer follows two years' operation on the flat-rate system and is a development of this in that it sets a service figure for a whole year in advance and guarantees it.

W. M. WEBSTER BACK FROM EUROPE

CHICAGO, Nov. 11—William M. Webster, commissioner of the Automotive Equipment Association, returned to his office in Chicago this week after a four months' vacation tour of Europe and Asia. One of the features of the trip which he most likes to relate to his friends was the opportunity to play golf on some of the best courses in Northern Scotland. Another thrill which he recalls with pleasure was provided by an airplane flight from London to Paris.

His memories of passport and customs regulations are not so pleasant. He crossed international boundaries 17 times. At first he was able to keep his copious supply of good American cigars with him by paying duties which soon amounted to more than the original purchase price, but when he went into Germany they were taken from him, and thereafter it was many a smoke that he suffered for the want of. He visited Spain, Egypt and Jerusalem.

DURANT BUYS GEAR COMPANY

SYRACUSE, N. Y., Nov. 11—William C. Durant, president of the Durant Motors Corp., has purchased the plant of the New Process Gear Co. in this city for $2,100.00.

Federal Reserve Bank Report Shows Steady Sales Increase

Southeastern States Enjoy Remarkable Time in October; Outlook Is Good

ALTANTA, Ga., Nov. 10—According to the monthly business review of the Federal Reserve Bank of Atlanta, covering general conditions in the sixth district, which comprises the group of southeastern states, tractor and farm implement sales the past five months have increased steadily each month, with the exception of September as compared with August, the lack of gain then being due to the strike situation.

Each of the past five months, the report shows, has witnessed a considerable increase over the corresponding months of a year ago, with the outlook now for a steady volume of sales until next spring, at least. Recent big increases in cotton prices are having the result of increasing not only tractor and implement sales, but automobile and truck sales as well, over the entire South, the bank's report shows. The report is based on questionnaires filled out by the larger distributors in all southeastern states, including Atlanta, Birmingham and New Orleans.

There appears to be a considerably better volume of sales in enclosed car orders among dealers over this section than since the fall of 1919, principally among smaller dealers in rural communities.

SAN FRANCISCO SHOW FEB. 17 TO 24

SAN FRANCISCO, Nov. 13—The dates for the Seventh Annual Pacific Automobile Show have been set for the week of Feb. 17 to 24, according to announcement made through the offices of George A. Wahlgreen, show manager. The big exhibition will be held in the Exposition Auditorium and the decorative designs this year will be Oriental, with many new and pleasing effects in color and design.

EDSEL FORD AT PORTLAND, ORE.

PORTLAND, Ore., Nov. 10—Edsel Ford, president of the Ford Motor Co., was a Portland visitor last week. He was on a tour of the Pacific Coast investigating business conditions, and while here had a conference with officials of the Oregon branch of the Ford Motor Co., which has headquarters in Portland. All the road men of the company in this territory were called in to attend the conference.

6-CYLINDER WEIDELY ENGINE

INDIANAPOLIS, Nov. 9—Weidely Motors has been provided with new working capital which enables the concern to meet the demand for its new 6-cylinder passenger car engine. The Weidely plant is said to have capacity for 12,000 engines a year. Further expansion of the plant is under consideration.

BUSINESS NOTES

Col-O-Hi Battery Co., Columbus, O., is a $100,000 organization, chartered under the laws of Ohio to manufacture various storage, starting and lighting batteries. The concern has been in business for about a year as a part of the business of the Ohio Tractor Co. A lease has been taken on a floor of the former plant of the Allen Motor Co., on Dublin Ave., where additional machinery is being installed to increase the output.

Fauntleroy Motor Co., Cincinnati, O., has been chartered with a capital of $100,000.

The Russel Harp Automobile Supply Co., Barberton, O., has been incorporated with a capital of $15,000.

Bauman-Wheaton Motor Sales Co., Lancaster, O., has been incorporated with a capital of $25,000.

Rainbow Tire & Rubber Co., which was incorporated during the world war with an authorized capital of $1,000,000, will soon start operations in its new factory at Delaware, Ohio. Chas. Ross is president, M. J. Bergin, vice-president and secretary, and C. A. Morrison is treasurer. Production of tubes exclusively will be started about March, 1923, in the factory in E. William St.

A bill in equity has been filed in the Superior Court of Boston by the Old Colony Trust Co. seeking an accounting, a sale of assets and appointment of a receiver for the Massachusetts Oil Refining Co.

Reorganization of the Syracuse Rubber Co., makers of the Syra-Cord, is under way following the appointment by Federal Judge Cooper of William Rafferty of this city as receiver for the company.

Fayette Tire Co., of Syracuse, N. Y., has been placed in the hands of Lewis Ryan as receiver, by Federal Judge Cooper.

The Moore Drop Forging Co., Springfield, Mass., automobile parts manufacturer, has awarded a contract for a $20,000 machine shop at its Chicopee plant, which will be ready for operation by New Year's. November production is said to be running about even with October, which represented the high mark for the year, and prospects for the rest of the year are good.

The report of the Willys-Overland Co. and subsidiaries for the quarter ended Sept. 30, 1922, shows estimated earnings of $4,099,675, from which reserve of $475,000 for balance of price decrease was deducted, leaving a balance of $3,624,675. Shipments for the last quarter were: Overland, model 4, 27,448; Willys-Knight, model 20, 8,277; Willys-Knight, model 27, 352; total, 36,077.

Wolverine Truck Trailer Co. has decreased its capital stock from $200,000 to $12,000.

B. L. Schmidt Co., of Davenport, Ia., has changed its name to Micro Machine Co. H. H. Yerk has been appointed sales manager to succeed H. M. Jerome. The company manufactures the Micro Internal Grinder.

The Black & Decker Mfg. Co.'s branch office and service station, formerly located at 318 North Broad Street, Philadelphia, has re-located the new address being 824 North Broad Street.

The Norwalk Iron Works Co., manufacturing air and gas compressors for all purposes and also refrigerating machinery, with general offices and works, South Norwalk, Conn., has just opened a Chicago office. It is at 627 W. Washington Boulevard and is in charge of L. R. Bremser who for 13 years was associated with The Gardner Governor Co.

Republic Rubber Co. is now producing pneumatic tires at the Youngstown, O., plant.

W. A. Wheeler, vice-president and factory manager of the Paige-Detroit Motor Co., has arranged with A. G. Zeller, president of the Michigan State Automobile School, to place chassis of the Paige and Jewett cars in the Auto school for instruction of their students.

Automobile Necessities Co., 728 W. Madison Street, Chicago, has been incorporated with a capital of $10,000, to manufacture and deal in automobile accessories, valves, safety devices.

General Auto Service Station, Inc., 1150 N. Clark Street, Chicago, has been incorporated with a capital of $15,000, to do general repairing, handle accessories, etc.

Davis Motor Parts Co., Inc., is a new concern in Nashville. The officers include: Alex Davis, president; Sam Levy, vice-president, and Charles H. Weinbaum, secretary and treasurer. They will do a general distributing business for all points in middle Tennessee, northern Alabama, and southern Kentucky.

American Turn Auto Corp., recently incorporated in Delaware, has moved its plant from Iowa to Bucyrus, O., where it will continue the manufacture of a device for the turning over of automobiles to enable workmen to get underneath for repairs and overhauling. The distributing company has located at 40 East Gay Street, Columbus, with H. M. Bennett as president and general manager.

I. J. Reuter, general manager of the Remy Electric Co., Anderson, Ind., manufacturers of starting, lighting and ignition systems, announces that the company by the end of this year will have broken all its previous production records, with an output of nearly half a million sets. A schedule of 1,500 generators and 1,500 starting motors per day has been set for November and December with corresponding increases in other departments.

Rolls-Royce Co. of America, Inc., is issuing $2,000,000 fifteen-year 7 per cent sinking fund gold bonds of an authorized issue of $3,000,000. The proceeds from these bonds will be used for refunding higher interest-bearing obligations and the remainder will be used for working capital.

An $11 reduction has been made in the standard ¼-in. electric drill by the Black & Decker Mfg. Co. This is the only reduction contemplated and this was made possible because of the trebled production on this size drill. The drill now sells for $28. Incidentally the latest improvement on this drill is the supplementing of the hand chuck by a three-jaw geared-nut chuck.

Mullins Body Corp., Boston, reports for the nine months ended Sept. 30 last, sales of $1,692,687 and a surplus after dividends of $66,872.

Johns-Manville Co. has called for retirement at $120 a share and accrued dividend, all of its outstanding preferred stock and will pay at some date in December a cash dividend of $40 a share upon its common stock. A stockholders' meeting will be called to authorize conversion of the company's 25,000 shares of its outstanding common stock into 250,000 shares without par value at the rate of eight shares of new for each share of old, reserving 50,000 shares for sale to employes on favorable terms. No new financing is contemplated. Preferred stock will be retired between Dec. 15 and Jan. 1.

The regular quarterly dividend of 1¾ per cent on the cumulative 7 per cent preferred stock of the H. H. Franklin Manufacturing Co. was paid on Nov. 1 to all stockholders of record on Oct. 20.

Timken Roller Bearing Co. reports earnings for the first nine months of the year of $6,339,000 after depreciation and taxes. October's gross business exceeded September's and current operations are up to the October total. This would indicate not only a new high record for the last quarter, but total earnings after all depreciation charges and tax write-offs of around $8,500,000 which is more than $7 a share on the stock.

In a suit brought by the Connecticut Telephone & Electric Co., of Meriden, Conn., the United States District Court at Chicago has granted an injunction against the Illinois Starter & Magneto Corp. restraining it from "selling, advertising or offering for sale parts intended as replacements" on Connecticut igniters. This covers breaker plates, breaker arms and springs therefor.

The Moon Motor Car Co. for the quarter ended Sept. 20 reports net profits of $326,478, equal after preferred dividends to $2.08 a share on the 154,213 shares no par common stock.

The R. & O. Tractor Equipment Co. has been capitalized at $25,000 at New Haven, Conn.

Swain-Hickman Co., Philadelphia, for six years distributor for Republic trucks, has entered the business of supplying truck replacement parts, as factory representative for a large number of parts makers.

The nominating committee of the Automobile Accessories Business Association of Philadelphia has presented the names of the following to be voted upon at the election in December: For president, Guy Lane; vice-president, George E. Fischer; for secretary, N. A. Petry, and for treasurer, R. A. Harp.

With the perfection of a new engine the Lycoming Motors Corp. has announced that its force of 700 men will be gradually increased, until an output of 125 engines a day has been reached.

Net earnings of Hudson Motor Car Co. for the quarter ending Aug. 31 were $3,656,218.69, or at the rate of $3 a share on the outstanding stock of the company. Total profits for the quarter were $4,183,327.72. Reserve for Federal taxes amounted to $527,109.03. Dividends paid amounted to $600,247.50, leaving a balance for surplus of $3,055,971.19.

Report Business in Healthy Condition on Pacific Coast

Usual Winter Slow-Down Less Evident Than Ever Before, Haynes Declares

DETROIT, Nov. 10—Following a six weeks' trip through the northwest territory and Pacific Coast, President F. J. Haynes of Dodge Bros. declares the general business condition to be "healthy from the feet up." With John A. Nichols, Jr., general sales manager of the company, he visited Dodge dealers, bankers and other merchants in all important cities, getting first-hand impressions.

A new cycle of prosperity has started, Haynes said, which is sound and healthy and has none of the aspects of boom times. Bankers and merchants everywhere regard it as substantial, permanent improvement. They are content to witness a gradual improvement because they have just seen a tragic example of the other kind of development—the kind that accumulates so much momentum that the brakes of good business judgment are useless in an emergency.

Haynes said the improved conditions were most noticeable in the cities and larger towns, but that the purchasing power and inclination to buy in the rural sections is improving appreciably. Both Haynes and Nichols were impressed with the absence of antagonism which has been attributed to bankers by automobile men in some parts of the country. "The average banker today views certain makes of cars as standard merchandise," Haynes said.

In almost every state there was declared to be less evidence than ever before of the usual winter slow-down in business. This condition was declared to be reflected at the factory, which is maintaining production at a point approximating the high-pressure marks of earlier in the year.

FAKE PROMOTER CONVICTED

NEW YORK, Nov. 11—Louis Enricht, the 76-year-old resident of Farmingdale, L. I., who claimed to have invented a process of making cheap gasoline from peat, has been convicted of larceny by a Long Island court on complaint of a Jamaica garage owner who had invested $3,000 in the Enricht Peat Corp. and who claimed Enricht made false representations. According to a representative of the United States Patent Office, no patent ever had been issued for the making of gasoline from peat, and it was also declared the method which Enricht claimed was impracticable.

200 CHEVROLET DEALERS MEET

BOSTON, Nov. 9—Nearly 200 dealers from all over New England were present at the annual conference of the Sills-Chevrolet Co. here. They came to listen to details of new models, meet factory executives and drive away demonstrators of the new Superior type.

The Readers' Clearing House

Questions & Answers on Dealers' Problems

Checking Chevrolet Generator

Q—We have a type G. H. Auto-Lite generator on a 1920 Chevrolet model 490 which does not charge except at speeds between 5 and 15 m.p.h. The ammeter goes up to 10 amperes and if you open the throttle further the cutout points open. If you close them again the ammeter shows a discharge. We have tried a new cutout with the same result. Moving the third brush has no effect. Is the neutral position for the other brushes obtained the same way as in a Ford generator? By this we mean, do you connect a battery to main brushes with the third brush lifted and set the main brushes so that the armature has no appreciable tendency to turn in either direction?—J. J. Ruf, Allenton, Wis.

Answering the first question in regard to setting the main brushes, would say that this method is correct for practically any type of direct current generator. Our first guess would be that some condition of vibration opens the shunt field winding or breaks a poor connection, and we would suggest your pulling the various connections to see if they are poorly soldered to the terminal. Also pull on the brush shunts or pig-tails to see if they are securely anchored in the brush.

In doing this, of course, you cannot exert any great force or they will be pulled out, even if securely anchored. To check up the shunt field in another way it would be possible to disconnect tne end which comes to the third brush and connect an ammeter in series with it. Then lift a main brush and close the cutout points. This should give current through the shunt field. If you find no current under these circumstances, you have probably lifted the wrong main brush.

With current through the shunt field you can remove the various connections and operate the engine at different speeds to see if there is any break in the battery current going to the shunt winding, and if you find that at some speeds, say 20 m.p.h., that the shunt field current suddenly drops down to zero, you can depend on it that there is a poorly soldered connection, which may be the connection between the coils.

Another possibility is that either the third brush or one of the main brushes is tight in the brush holder, and due to slight eccentricity of the commutator, will not remain in contact as the speed increases. This might be detected by increasing the tension on the brushes temporarily with the fingers while making a test. Another possibility is that there is a short in the armature which only shows up at high speed, due to centrifugal force affecting the wires. To determine this you can disconnect the shunt field or lift the third brush and run the machine on its own residual magnetism.

It will now be necessary to use a low reading voltmeter, possibly a millivoltmeter. This voltmeter or millivoltmeter should show a reading which increases exactly in proportion to the increase in engine speed, and if with increased engine speed this reading comes up at first and then drops off, it shows trouble either in the armature or in the brush connection to the armature. In view of the fact that you state a discharge is obtained when holding the cutout points closed with the engine running rapidly, we believe that the trouble is in the field circuit, as shorted armatures with generator running do not usually show appreciable discharge, the ammeter needle being about zero or a fraction of an ampere one way or the other.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

Readers' names will not be published with articles, if a request to this effect is received with the letter. The name and address should be given, however, so that we can send a copy of our answer direct by letter. This saves waiting for the answer to be published, which sometimes occurs several weeks later, depending upon the space available.

Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegam.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert, P. L. Dumas and A. H. Packer; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.

Illinois Automobile Racing Laws

1—Is automobile racing allowed in Cook County on Sundays and holidays?

1—There is no law against automobile racing, or such, on Sunday, Section 573 of the Criminal Code says that "whoever disturbs the peace and good order of society by labor or by any amusement or diversion on Sunday, shall be fined not exceeding $25.00." There are no cases in point on automobile racing. But Sunday baseball, also shows and theatres have been permitted and the rights of the promoters upheld by the Courts. The test in these cases is whether they disturb the "peace and good order of society." A theatre run in a neighborhood of homes has been held guilty where a theatre run in a business section was said not to disturb the peace and good order.

It appears that much would depend on the neighborhood of holding the races, and the care taken in holding the races, as regards sightliness, noises and odors in the locality. There appears no question about holidays being a suitable time as regards the law.

2—Are promoters liable for injury or death sustained by a driver entered in such contests? Said driver will have signed a waiver disclaiming any damages for personal property losses incurred in the contest.

2—The promoters may be held liable for injuries to drivers and their mechanics. They were so held in the famous case of Kellum's widow against the National Motor Vehicle Company and Indianapolis Motor Speedway Company. Here Kellum, a mechanic with Aitken, as driver, was killed through a defect in the track. He was held not to have assumed the risk of the racing where the jury found that he was not aware of the defective condition of the track.

In these cases the injured driver is held to have assumed all the ordinary risks of such a hazardous undertaking. And in all such cases they must show that the promoters were negligent causing the injury. The degree of care on the part of the promoters toward the drivers is that of an ordinarily prudent person acting in their capacity. The duty and negligence will depend on the circumstances of each particular case. Promoters must use foresight to prevent accidents and injury but only that of ordinary prudence.

While the rule of law is liberal and just, juries are prone to decide questions of fact in most negligence cases in favor of the injured party or his representative in case of death.

(Continued on next page)

Garage and Filling Station on Corner Lot

Q—Will you please answer in your columns and out-line in detail sketch of garage and service station suitable for corner lot 84 x 140 ft. as per sketch enclosed. I am marking in the sketch different things to give you an idea as to what we have in mind.—H. O. Bell & Co., Missoula, Mont.

Your building is going to fall far short of the capacity you expect of it and it is a question with us what to sacrifice. The stock room has plenty of capacity but the shop will hold fourteen instead of eighteen cars and the storage capacity is of nine cars instead of twenty. By discarding the filling station space, enough could be added to bring storage nearly to twenty cars but this would necessitate more or less arrangement.

The stock room, show room and office are all as large as you intended to have them we believe, and we especially like the stock room layout since it enables the stock keeper to watch both, the shop and retail sales windows. Unless you sacrifice about seven feet of office space to a passage you will be obliged to bring cars into the show room from outside.

As to the advisability of the filling station, there is a great difference of opinion but it is pretty generally believed that a station of this sort brings other business in parts, accessories and tires that makes it worth while. In your case, however, it is questionable whether the space would not be more valuable devoted to shop or storage. There should be some consideration given to other stations in the vicinity. If the neighborhood is well supplied with well patronized stations you might better save the space but if there are no up-to-date stations near you and you have a good location there is no question but that it will be a decided asset.

It would be quite practical to support the roof on trusses spanning the complete short dimensions, doing away with posts completely.

Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

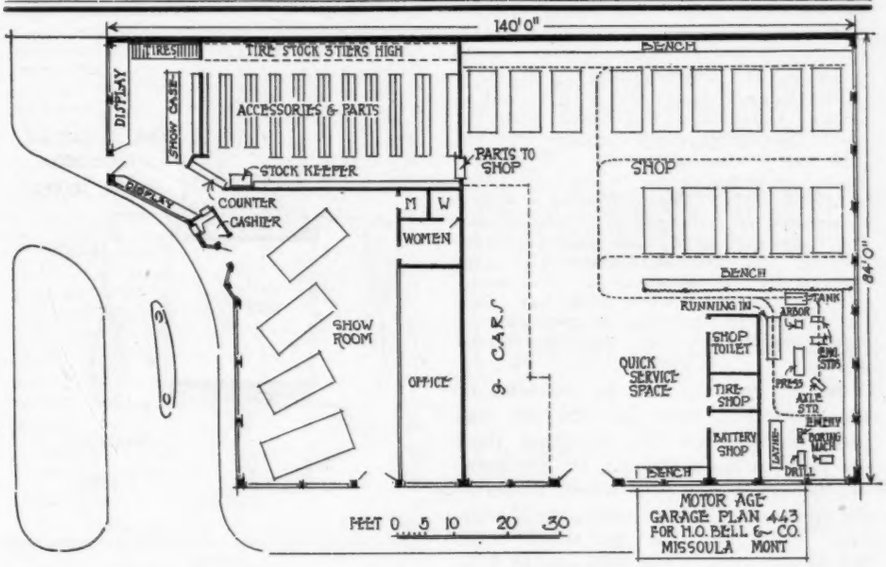
What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

How much of an accessory department is anticipated.



(Continued from preceding page)

A waiver of claim for damages for personal property losses will not affect one's rights for personal injuries.

It might be well to get a waiver of claims arising out of personal injuries, as such might have an advantage on question of evidence, as assumption of risk. But I do not think that a waiver of such injuries would be valid as a defense to a claim, being in violation of public policy.

3—Are the promoters liable for personal and property damages of the onlookers or audience who have paid an admission fee for viewing contest?

3—The promoters of automobile races owe a duty to the public who pay for the privilege of witnessing such races, of guarding them from injury "by such means and measures as reasonable prudence and foresight would suggest." If they did not use this reasonable prudence and foresight, and thereby an injury results to one of the patrons, they may be held liable for any damage resulting, in an action brought and showing these facts. The liability then is founded on negligence of the promoters, in failing to perform a duty they owed to the injured party.

The degree of care required to be exercised by the promoters, in any given case or under any set of facts that might arise, is only the care of ordinary and reasonable prudence. (Platt vs. Erie County Agricultural Society, 164 App. Div. (N. Y.) 99. Of course, the promoters are not liable even if negligent if it be shown that the injured party was also negligent contributing to the cause of the accident.

This rule of law was also applied in the case of a patron crossing a race track being struck by a racer "warming up," 100 Me. 565, and in another where a railing gave way with a crowd, injuring several, 118 Md. 600, and in still another where a seat in the bleachers broke dropping a patron to the ground causing serious injury 156 Mich. 337.

GARNISHEE TO COLLECT BAD CHECK

Q—We did some work on a customer's car which amounted to (labor and parts) about $86.00. We took two predated checks, one for $40 and one for $46. The first one running thirty and the second one sixty days. At the end of thirty days we turned the first check into the bank, and it came back marked no funds. We went out after him and he made it good.

At the end of sixty days we turned in the other check and it came back in the same way. We have made several trips to see him and he promises to take it up, but that's all it amounts to for it is now thirty days since the last check was due. He is working steady for the railroad company here in the shops and the price for the work and parts has never been called in question. In fact he has several times expressed himself more than pleased with the job. What would you advise to do in this case?—Highway Sales Co., Kingsville, Texas.

If you have a witness that the customer expressed himself as being pleased with the work you should be able to get judgment against him. The check is evidence of satisfaction with the job, so you may sue and take judgment, then bring his employer into court under a garnishment proceeding. Now railroad companies generally will not stand for garnishment of employes. So your judgment would have to pay or lose his job. Perhaps a letter of threat from you that unless the check is paid you will proceed to garnishment of his wages, will bring a settlement of the account; if not, you may proceed in court.

I do not believe the facts you present warrant a charge of obtaining possession of the repaired car by false pretense or by fraud. If so, a replevin would lie to recover possession of the car if still in debtor's hands until the amount is paid. If debtor had not funds in the bank at the time the checks were given you and never did put any in the bank thereafter, such would tend to prove he then had no intention of putting such money on deposit with the bank, and perhaps a criminal prosecution would lie against the debtor. If you think the facts warrant, you might take the matter up with your public prosecutor.

Peculiar Knock Occurs at Certain Speeds

Q—We have an Oldsmobile eight model 47 which has a peculiar noise accompanied by a distinct knock or tapping sound which occurs every other revolution of the engine. At any car speed, up to 12 m.p.h. the engine operates smoothly but above 12 m.p.h. the knock is very noticeable. Above 30 m.p.h. it begins to subside. It is also more noticeable when coasting than when pulling.

This engine has been worked on by several Oldsmobile mechanics with the result that, after each operation, the engine was worse than before, and the condition has been going on for some four or five months. The condition was first diagnosed as a connecting rod bearing, but examination of main bearings, connecting rod bearings and wrist pins showed them to be all O. K. The knock is more noticeable when cold than when hot. What is likely to be the cause of this condition.—C. F. Boatner, Byers, Texas.

In our opinion, that in checking up the connecting rods you did not take into consideration the fact that there are two bearing surfaces. We are showing herewith two cuts which illustrate the correct methods of fitting these bearings. The fact that the knock when hot is less than when cold, would indicate that expansion is reducing the amount of clearance, and consequently reducing the noise produced by the knock. When knocks of this kind occur, it is practically always necessary to put in new bearings, this being the one which fits directly on the crankshaft. This is due to the fact that if an attempt is made to fit it, its circularity is lost. The following instructions are taken from the Oldsmobile instruction book covering this work.

In fitting the connecting rod bearings, it is essential that the correct clearance be observed to give proper action. If the mechanic uses those methods common in fitting the connecting rod bearings on four-cylinder engines, the bearings will be drawn too tight and will cause future trouble.

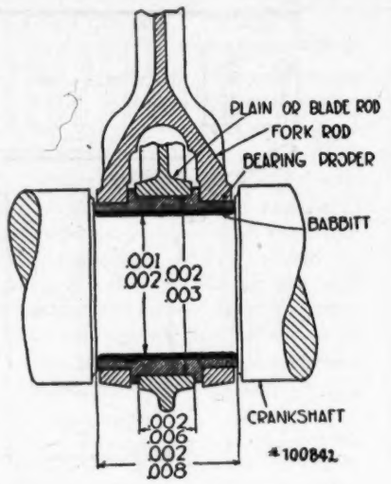
The plain, or blade rod shown in Fig. 5 bears on a bronze bushing, which in turn runs on the crankshaft. If this bearing does not have from .002 to .003 inch clearance the bushing will expand faster than the plain rod and cause binding. This condition will be indicated by a burning out of the babbitt around the center of the bearing proper. The following is the proper method of fitting the plain or blade rod bearing to obtain the proper clearance.

First, fit the babbitted bushing to the crankshaft bearing, and bolt the fork rod tightly in place.

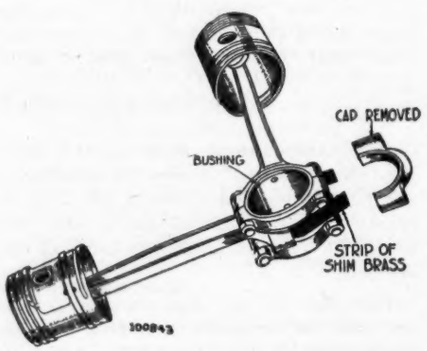
Second, procure a strip of shim brass ¾ in. wide and .001 to .0015 in. thick, just long enough to lap around the plain rod bearing on the bronze bushing.

Third, bolt the plain rod in position and adjust until, when the bolts are tight, the plain rod may be turned; but not loosely. Then if the brass shim be removed, the plain rod will have the proper clearance.

We are of the opinion that in your particular case the clearances are too great, due to wear, this condition possibly being true on the inside bearing which makes contact with the crankshaft, but when new bearings are installed the above instructions should be observed.



Clearances required on Olds 8 connecting rods



Olds 8 connecting rod assembly

It is of course possible that the knock is due to some other condition and we are accordingly sending you a sheet which gives 20 possible causes of knocks.

HIGH-SPEED ENGINES

Q—Publish in your next edition the fastest engine used in the stock car and the name of the car that uses this engine.—Herbert Williams, East Chicago, Ind.

From what data we are able to gather, we find that the Essex is the fastest engine used in an American stock car. Among the engines having more than four cylinders we would mention the Duesenberg Straight Eight and the Cadillac V-type Eight as being examples of the high-speed type of engine design. The approximate maximum revolutions of the stock Essex engine are in the neighborhood of 3,400 to 3,600 r.p.m.

Functioning of Marmon Oiling System

Q—I followed your suggestions on old Cadillac four and it sure hits down the big road in fine style. We are now building a Marmon 34 engine and wish information on the oiling system. The oil regulator, as near as I can make out, is controlled by vacuum from the intake manifold, Is this correct? Explain the action of this mechanism.

1—The reserve oil supply in the Marmon 34 is carried below the sweep of the cranks in the oil reservoir. The oil is conducted to all bearings by internal piping with the exception of one external pipe on the left side which leads from the oil reservoir to the oil pump. This pipe is provided with an oil trap which makes the pump self-priming. The oil pump is located at the rear end of the engine just back of the camshaft by means of which it is driven at half engine speed.

The bearing for the oil pump drive shaft has a groove along the top through which there is an escape of a slight amount of oil under full pump pressure. This oil supplies the Oldham couplings by which the pump is driven with flood lubrication and at the same time provides pressure lubrication for the camshaft rear bearings. The path of the oil is as follows: All oil delivered by the pump is fed to the rear main bearing bushing groove and from there into the crankshaft. As the oil travels through the shaft from the rear to the front main bearings, part of it is forced out lubricating the center main bearing and the connecting rod bearings.

Oil from the connecting rods splashes upon the cylinder walls and lubricates them. The up stroke of the piston at top edge of the piston skirt wipes the excess oil from the cylinder walls into the space between the head and the skirt and this oil provides adequate lubrication for the piston pins. The front camshaft bearing is lubricated from the front main bearing, an interconnected oil hole being provided in the crankcase casting. From the front main bearing the oil is carried to the oil pressure regulator located at the right hand front corner of the engine. There are two valves in this regulator; a safety valve which fixes the maximum pressure obtained in the oil line, and the automatic pressure regulating valve that is operated by the vacuum in the intake manifold.

Briefly this control gives the following results: When the engine is under heavy load with a full open throttle, the maximum pressure of oil is obtained upon the bearings which gives abundant lubrication. As the throttle is closed the pressure decreases and oil escapes or is by-passed from the pressure line. This by-passing also takes place when the maximum pressure is reached and the safety valve opens. An oil line is lead from the regulator across the front of the engine up to the header cover, where it feeds the oil into the cups formed in the rocker arms. Here it goes to lubri-

cate the push rods and tappet surfaces.

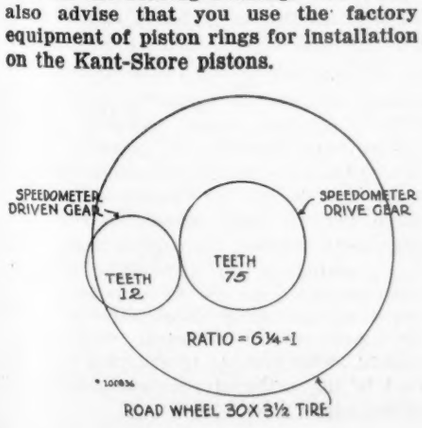
Part of the oil which falls from the tappets is filtered through a screen and then serves to lubricate the camshaft center bearing. The remainder goes to lubricate the timing gears and then drains back into the oil reservoir. The pressure on the gage should register between 25 and 30 lbs. at a car speed of 35 or 40 m.p.h. The compression of the spring on the safety valve can be regulated by a screw that is carried in the valve cap. When the proper pressure has been obtained the adjusting screw can be locked in place with its check nut. The screw and check nut are covered with a cap to prevent anyone tampering with the adjustment, also to prevent oil leakage.

2—What do you think of the Kant-Skore piston in this car, in place of regular Marmon pistons? We have reground the block and then hand-lapped a set of these Kant-Skores in with .0015 oil clearance on a side, is this enough?

2—MOTOR AGE has always advocated except in the case of extremely old cars that the regular manufactured equipment be used when it referred to parts of the engine. However, the piston referred to is a quality product, but will require careful fitting in order to produce results. The .0015 clearance on each side, that is .003 total piston to cylinder clearance, should be sufficient, providing the piston has been relieved in the vicinity of the piston pin hole. We would advise that you reduce the diameter of the piston, at all points one to 1½ in. outward from the edge of the piston pin hole, to a depth of about .008 to .010 on each side of piston.

3—Have reground the shaft and made new bearings, a full set for the mains and rods. Machined the babbitt in the rods with .002 clearance for oil. Is this enough?—C. L. Forney, Motor Service Garage, Ft. Collins, Colo.

3—.002 in. clearance for oil is the right value, but it is based on bearing surface that has been reamed and polished. You state that the babbitt was machined and we doubt whether machining the surface of babbitt will produce the necessary smooth surface which is required. If the bushing has been reamed or scraped and then burnished to a diameter that will allow .002 clearance for oil, you can rest assured that no trouble will be encountered. We wish to emphasize the necessity of securing a very smooth surface on the bearing bushing. We would also advise that you use the factory equipment of piston rings for installation on the Kant-Skore pistons.



Method of Adjusting Spiral Bevel Gears

Q—We have a Model 37 Allen car, 1917, which was originally equipped with straight bevel ring and pinion in the rear axle, this having been used for 5 years. Somehow or other it got out of alignment in the last three months and we have since installed two sets of spiral ring gears and pinions and have adjusted them in accordance with instructions received from MOTOR AGE. We have put in other similar ring gears and pinions on other cars and have never had any trouble except in this particular case where the teeth continue to break. We would like your advice as to the relative strength of straight or spiral bevel gears and would like to know what change you would recommend in order to take undue strain from the ring gears.

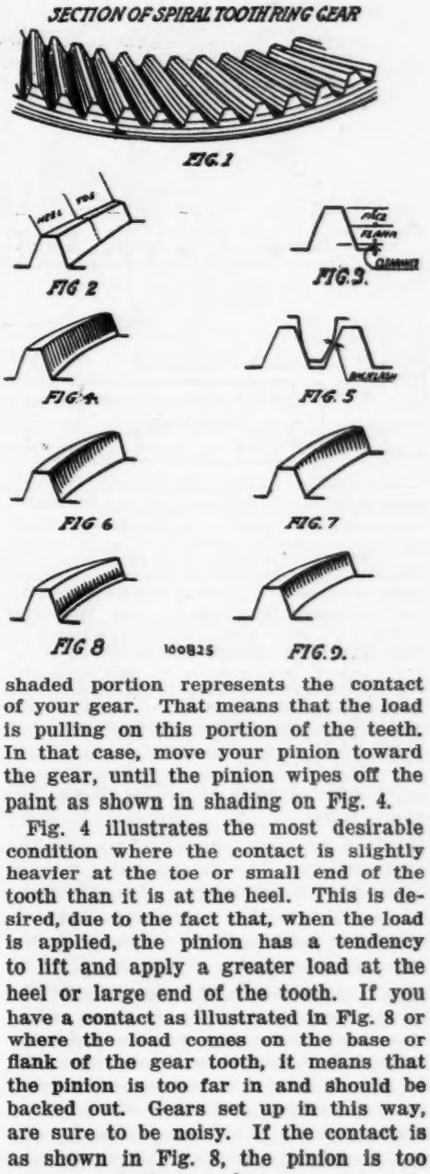
This car has been equipped with oversized rear tires and we wonder if this puts an extra strain on the gear teeth.—L. G. Swanson, Perry, Iowa.

1—The instructions previously given to you, according to our records, were of a general nature such as could be applied to the ordinary bevel gear and pinion. When it comes to installing the spiral bevel gears, however, a great deal more care must be used in order to keep them from breaking.

You state that somehow or other the gears got out of alignment and if this was due to an accident in which the axle housing was strained it may be impossible to install spiral bevel gears without their continual breaking. With this type of gear it is also quite essential that the bearings be in A-1 condition, so that a line through the center of the gear and the center of the pinion absolutely meet at some point. It would accordingly, be well to check the bearings and see that there is no radial motion possible.

When it comes to installing a set of spiral ring gears and pinions they should first be rolled on one another by hand in order to note the position which the pinion takes either at the large or small end and whether it sticks out or runs in. The pinion and gear should then be assembled in the axle as nearly as possible in the same position, allowing from .005 in. to .008 in. backlash between them.

Place the axle under the car and at the same time paint the gear teeth with a fine coat of white lead. After this is done jack up the rear wheels and start the motor, throwing transmission into high gear, also throw in your brakes which must be equalized so you get about the same load on each wheel. This will wipe the paint off the teeth. You can find a condition as illustrated in Fig. 9, in the attached sketch. The



shaded portion represents the contact of your gear. That means that the load is pulling on this portion of the teeth. In that case, move your pinion toward the gear, until the pinion wipes off the paint as shown in shading on Fig. 4.

Fig. 4 illustrates the most desirable condition where the contact is slightly heavier at the toe or small end of the tooth than it is at the heel. This is desired, due to the fact that, when the load is applied, the pinion has a tendency to lift and apply a greater load at the heel or large end of the tooth. If you have a contact as illustrated in Fig. 8 or where the load comes on the base or flank of the gear tooth, it means that the pinion is too far in and should be backed out. Gears set up in this way, are sure to be noisy. If the contact is as shown in Fig. 8, the pinion is too far in and if contact is as shown in Fig. 9, it is too far out.

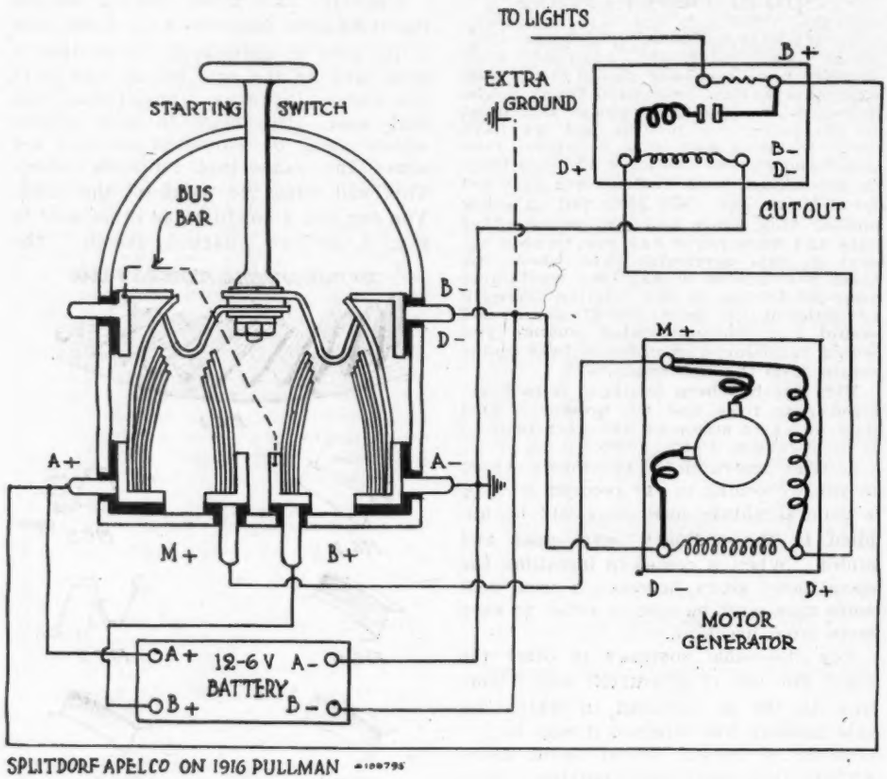
If the contact on tooth appears as shown in Fig. 6, it means there is too much backlash between ring gear and pinion. This requires moving the ring gear toward the pinion and if this is not done, the extra heavy pressure at the large end of the tooth will cause it to break off. If contact is too heavy at the small end as shown in the Fig. 7, the small end of the tooth will eventually break off. The size of tire used has nothing to do with the case.

DETERMINATION OF SPEEDOMETER GEAR RATIO

Q—We wish to hook up a speedometer without the customary swivel joint on the front wheel and use only two gears as follows: One gear on road wheel and one gear on the speedometer chain as per enclosed pencil sketch and not use the swivel joint. The car wheel has 30x3½ tires. Want to know the size of gears required to drive the speedometer head at the correct speed or, in other words, how many turns or revolutions would the speedometer driven gear have to turn for 1 revolution of the drive gear on the road wheel. What standard speedometer Stewart gears could be used for securing the proper results without a swivel joint? —Thomas H. Cook, Care McLaughlin Motor Car Co., Edmonton, Alta, Canada.

Using a standard Stewart speedometer head a ratio of 6¼ to 1 will be required in order to give the proper shaft speed. The gears that will provide this ratio can be secured from the Stewart-Warner Speedometer factory of Chicago, Ill.

6-Volt Generator Produces 30 Volts—What's Wrong?



SPLITDORF APELCO ON 1916 PULLMAN

Q—What is wrong with this system, a Hollier-Eight-1916 model, with motor-generator, shows 30 volts at the generator and cutout. The cutout and indicator burnt out and were replaced with a 6-volt Auto-Lite cutout, which works O. K. We cannot, however, make the ammeter register either discharge or charge. When you step on the starter the hand on the ammeter goes off the scale 30 amperes, What is th cause of this?—E. L. Generous, East Syracuse, N. Y.

We are showing herewith wiring diagram which, while originally made for the 1916 Pullman, is also correct for the 1916 Hollier. The only possible way of getting 30 volts from the generator is by having a break in the circuit between generator and battery. This prevents the generator from having any place to send its current and consequently the voltage will build up very high. Inasmuch as you state putting an Auto-Lite cutout in the circuit made operation O. K., we assume that the open circuit must have been in the cut-out itself.

In other words, the shunt winding was doing its duty but the contacts did not close or, if they did close, were badly oxidized and burnt, so that no electrical connection was made. Referring to the diagram, it would mean that the circuit in the cutout from D plus to B plus was never made even if the points appeared to close. There would then be no path for the current except from the generator through the fine winding of the cut-out and back to ground and, as this current is very slight, it would have very little effect on the voltage, which rising to the value of 30 volts would very quickly burn out this fine winding.

The trouble with the ammeter is possibly due to the fact that you have it wrongly connected. It should be in the circuit from A plus of the starting switch around to B plus at the cutout. In other words, if you would cut open the wire at the lower right hand corner of the diagram and connect in your ammeter you would have it in the circuit correctly. Discharge current would then go from the A plus battery around through the meter and out to lights, while charging current would travel from the D plus terminal of the generator up to the corresponding terminal of the cutout and through the heavy winding and the contacts to the B plus terminal and down through the ammeter in the reverse direction.

The heavy current through the ammeter is doubtless due to your having it connected in such a way that it is carrying some of the starting current. We have not taken the time to try to figure the exact location that you may have placed this meter, but we are reasonably certain that you have it in the wrong place and the obvious remedy is to properly connect it as above indicated.

There is also a possibility with this system of trouble in the starting switch in which occasionally the bus bar burns out. Accordingly, if you test across the terminals shown at the two ends of this bus bar and do not find a circuit you should make a connection on the outside of the switch. It would also be well to check up the starting switch and see that it is properly paralleling the two halves of the battery by connecting A minus and B minus together as shown and by connecting A plus to the upper end of the bus bar which makes a connection over to B plus. When the starting switch is operated the two little hook shaped contacts connect A plus to M plus and B plus to A minus.

CHECK IGNITION TIMING

Q—We are writing to get help on an Auburn Six, 1917, model 6-39, which is giving trouble from overheating. Have done the following: Installed new radiator, cleaned the oiling system, checked the ignition timing, put on new hose, cleaned cylinder block and water pump. This car heats to boiling in a short time and will knock on pulls when hot.—C. Arthur Fox, care Fox Garage, Cedar Rapids, Iowa.

In going over the list of things that have been done on this car we note that no mention has been made of checking the valve timing. There were three different makes of engines used in the 6-39 model of Auburn—the Continental, Teetor and Rutenbur—and we are unable to supply timing unless we know which make of engine was used. However, it is possible to check the timing by the flywheel marks.

As a suggestion we might also state that if the car is equipped with Remy ignition, the points should be set to break with the pistons on upper dead center exactly, with the spark in full retarded position. We understand that the recommended setting is slower than this and produces overheating in some of the 6-39 model cars, and have been advised by the local service station that the timing should be set as stated, that is, so that the points are just breaking when the piston is on upper center. This suggestion, together with checking the valve timing, we believe should eliminate the overheating, providing that the cylinder block has no defects or sand holes.

FUNDAMENTALS GOVERNING VACUUM TANK INSTALLATION

Q—Can you give me a few pointers on how to install a vacuum tank on a 6-40 1916 Hudson. The tank is in the dash and it would be impossible to place the vacuum tank above the gasoline level in the fuel tank.—Wild Bros., Springfield, Minn.

1—The vacuum tank vent pipe should always be located at a point above the level of the fuel in the main supply tank and as this is impossible to accomplish in this job, we would advise against the installation of the vacuum tank. It is difficult to understand what would be gained by installing a vacuum tank where the supply tank is mounted in the dash, because the big feature of the gasoline vacuum tank system is the fact that, with its use, the supply tank may be mounted in an accessible position such as the rear of the chassis. Provided the gas tank to carbureter leads or pipes are of sufficient area there should be no trouble in securing enough fuel in the carbureter at every position of the car.

Wiring and Oiling Diagram of 1914 Packard

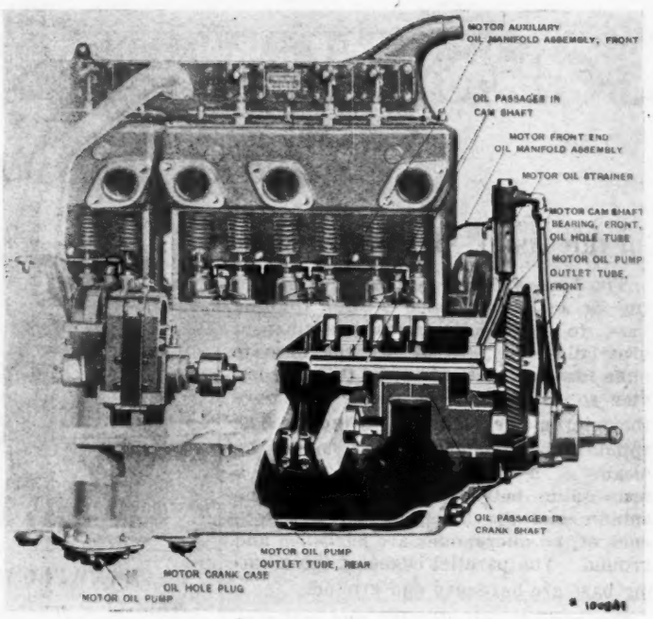
Q—Publish wiring diagram; also oiling diagram for the 1914 model 2-38 Packard car.—Sam's Repair Shop, Provincetown, Mass.

The diagrams requested are shown herewith. Lubrication of the engine is accomplished by means of a gear driven pump at the bottom of the crankcase. This sends oil to the front of the engine where it goes through an external pipe to the motor oil strainer. The oil then goes down to the front of the camshaft which is hollow and acts as an oil reservoir or distributer. The oil from the hollow camshaft goes from the camshaft bearings down to the main bearings where it has a chance to get into the crankshaft which also carries oil.

Through the crankshaft, the oil gets to the connecting rod bearings and from these it passes through oil tubes attached to the connecting rods, up to the piston pin bearings. Baffle plates limit the amount of oil reaching the cylinder walls, to the amount needed for light running. When the motor is under a heavy load the auxiliary system provides for the increased oil requirements of the cylinders.

The front end bearings are lubricated by pressure from the strainer housing. All the overflow from the release valves flows down and lubricates the front end gears. There are sediment pockets in front and at the rear of the oil pump. The oil is strained before it enters the pump and is strained again before it enters the camshaft. Two baffle partitions are located in the bottom of the crankcase to prevent splashing of oil in the oil well.

The auxiliary oiling system, for the lubrication of the piston and cylinder walls when the motor is under heavy load, enters through the cylinder walls on the right side. This system obtains its supply from the rear end of the camshaft by the throttle. When the throttle is opened 1/3 way, the auxiliary oil valve starts to open, allowing oil under pressure to enter the auxiliary oil lead, which feeds lubrication to the cylinder and piston walls.


MOTOR AUXILIARY OIL MANIFOLD ASSEMBLY, FRONT
OIL PASSAGES IN CAM SHAFT
MOTOR FRONT END OIL MANIFOLD ASSEMBLY
MOTOR OIL STRAINER
MOTOR CAM SHAFT BEARING, FRONT, OIL HOLE TUBE
MOTOR OIL PUMP OUTLET TUBE, FRONT
OIL PASSAGES IN CRANK SHAFT
MOTOR OIL PUMP OUTLET TUBE, REAR
MOTOR CRANK CASE OIL HOLE PLUG
MOTOR OIL PUMP

Path of oil in 1914 Packard engine

CHANGING STARTING MOTOR AMPERAGE

Q—We have several old style Type Y Gray & Davis starting motors which, on six volts, draw 100 amperes and turn up 2,800 r. p.m. We would like to change the winding of these so that they would draw about 25 amperes and six volts so that we could use them for light power. What size wire should be use in field coils and how much. Also what change would be necessary in the armature winding.—England-Brownlow, Springfield, Mo.

The design of electrical machinery is a business in itself and the best that we can do is to give a guess as to the changes required. If the armature should require different winding we doubt if the proposition would be a paying one. Our first suggestion would be to rewind the field coils only, with No. 8 wire. We know, in the first place, that the field coils must be capable of carrying 25 amperes and if so, a wire must be used which is able to handle that much current. Another possibility is to send one of the machines to a good electrical concern, name of which will be given by letter, so that an estimate can be made of the cost of doing this work and also an accurate idea can be obtained as to whether the scheme is feasible or not.

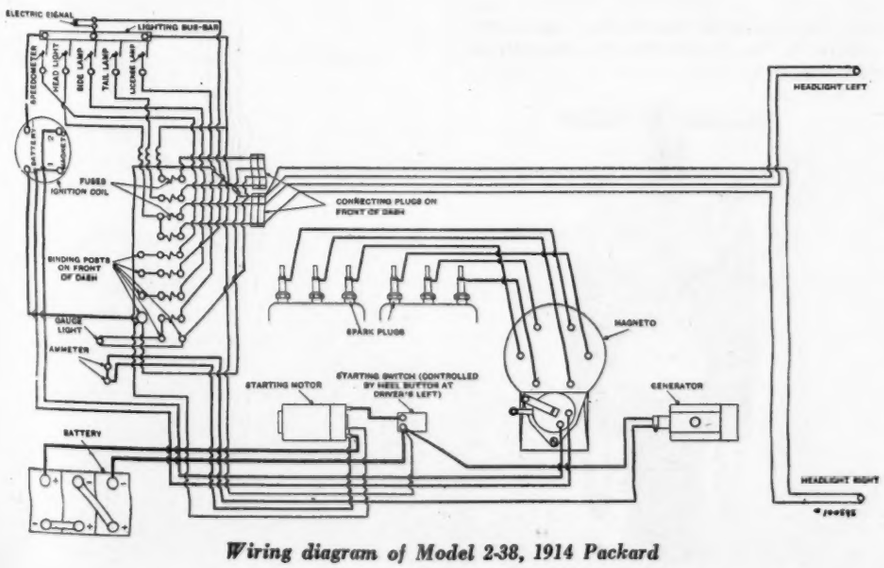
PENNSYLVANIA LIEN LAW

Q—What is the Pennsylvania law for repair men working on automobiles, to be able to collect on work finished.—T. Luce, Meshoppen, Pa.

The state of Pennsylvania does not by statute give the repair man a lien on automobiles repaired by him, and so the common law lien must be claimed by him, if he cares to hold the repaired automobile as security for his payment.

This lien gives the repairer the right to retain possession of a repaired article until his charges are paid. If one does not keep possession of the repaired property the lien is lost. However, if an owner gets possession by fraud or false representation the lien is not lost and the repairer no doubt may recover the car or repaired property by replevin. Also, a statute makes it a misdemeanor or crime for one to get possession of his car from a repairer through false and fraudulent representations.

Now if you have given the owners time within which to pay, that is, have extended credit to them, then you have lost this lien right. If you have done this you may enforce collection by bringing suit and getting a judgment, then you may levy on the car or any other property of the debtor and thus enforce collection.



Wiring diagram of Model 2-38, 1914 Packard

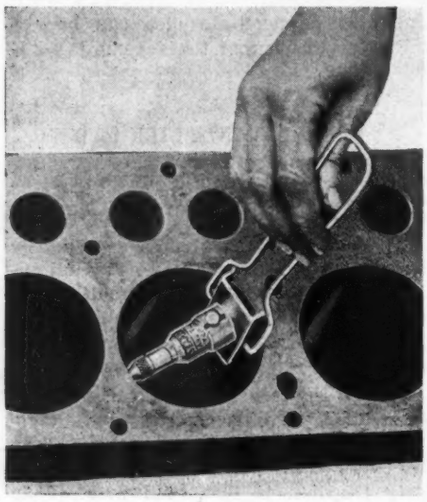
SERVICE EQUIPMENT

Aids for Time Saving & Accuracy

BEARD INSIDE MICROMETER GAGE

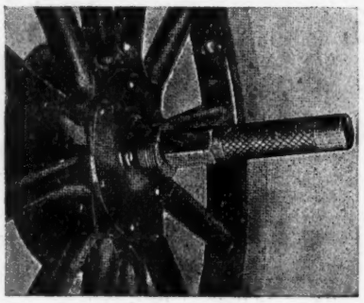
The body of this micrometer is a sliding fit in the bushing of the aligning base, to allow adjustment for different size holes. It also allows the base to slide forward on the body of the micrometer so that it can be tilted to remove the micrometer from the cylinder. The spindle of the micrometer is locked by means of a clamping screw, having a brass plug between the thread of the spindle and the clamping screw. Both ends of the micrometer are hardened and ground. The parallel edges of the aligning base are hardened and ground.

The gage is self-aligning and self-centering, by holding the base against the cylinder wall and turning the knurled spindle to the right it touches the opposite wall, gives direct reading in .001 of an inch, one complete revolution of the spindle indicates .050 of an inch advance of the screw. Each graduation of the barrel represents .001 of an inch. Made by the L. O. Beard Tool Co., Lancaster, Pa.



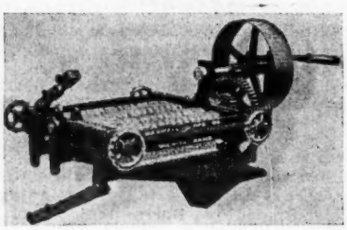
LU-THE WHEEL AND DRIVE PINION PULLER

The Lu-The Wheel and Drive Pinion Puller is the product of the F. A. Luthy Co., Jackson, Mich., and is made to eliminate the damage and trouble caused when a wheel is hard to remove from an axle. It is made of cold rolled steel, machined and heat treated, in various sizes for the different models of cars. The cut shows one attached to a wheel, ready to receive a slight blow from a hammer which action loosens the wheel.



MAXWELL BEAD CUTTER

This is a machine for cutting beads off old tires. It is adjustable, so that the tire can be cut all around above the heel on the bead on clincher tires. This enables the bead to be removed, leaving two plies of fabric the full diameter of the casing, or clear to the toe of the bead. Claims are made that this machine is easy to operate, that it feeds the tire around and that it will take all sizes. Made by the Maxwell Manufacturing Co., Wichita, Kan.



CRAMP BEARING FITTING TOOL

The cut shows the Cramp Bearing Fitting Tool clamping a rod in a Ford engine. It is also used for fitting rods and mains, aligning rods, reaming rods and mains and babbitting rods and mains. J. W. Cramp, 623 W. 10th Street, Los Angeles, Calif.

CORRECTION THERMOMETER

Specially designed for storage battery testing with a Fahrenheit scale of 0 to 130 degs. A correction scale is printed opposite the thermometer and marked in red with plus and perpendicular signs, thus affording the operator the opportunity of getting the correct hydrometer reading at a glance. $.90. Battery Equipment & Supply Co., 1458 S. Michigan avenue, Chicago.

M-B INSULECTRIC SCREW DRIVER

This screw driver is especially useful when testing spark plugs as no shock can be given through the handle. It also withstands the effects of hammer blows. M-B Tool Co., Danielson, Conn.

M-B ADJUSTABLE AUTO VALVE GRINDER

The feature of this grinder is the fact that it is adjustable as shown in the cut. A fitment makes it possible to grind Ford and all other kinds of valves with this tool. M-B Tool Co., Danielson, Conn.

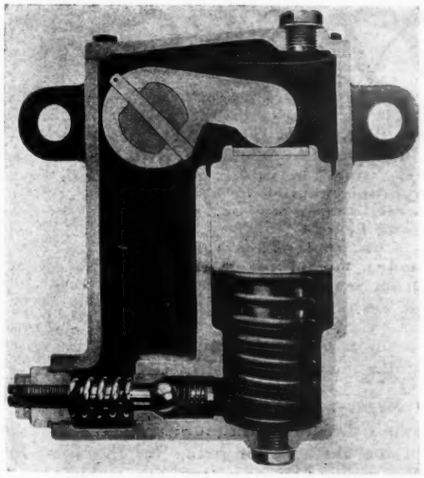
The ACCESSORY SHOW CASE

New Sources of Retail Profit

MANZEL SHOCK ABSORBER

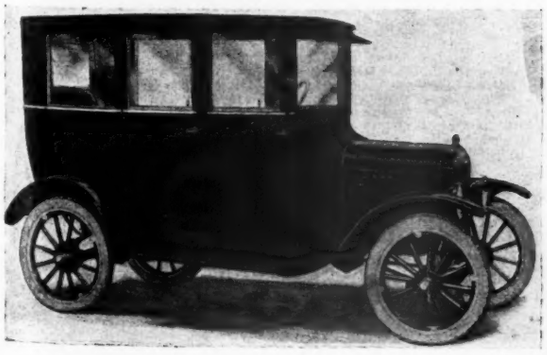
A new shock absorber is announced by Manzel Brothers Co., 306 Babcock Street, Buffalo, N. Y. This device is of the hydraulic type and can be furnished for practically all models of cars. It is attached to the frame, and is connected to the axle by means of a strong webbed strap and clamp. It does not interfere with the normal compression of the springs, but co-operates with them to check the rebound, preventing spring breakage and side sway, and causing the car to ride smoothly.

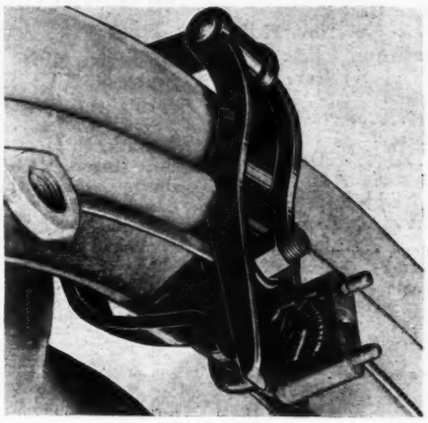
A principal feature of the Manzel is its automatic control by means of double acting valves, which oen and close according to the severity of the shock and control the passage of the oil, which is used as the co-operating medium between the inner and the outer chambers. When the automobile spring compresses, the piston moves upward and the oil is drawn into the inner chamber.



COLONIAL BODY FOR FORDS

The Colonial Body Co., Waltham, Mass., has brought out a four-door sedan body for Ford cars and several improvements are made in interior finish and riding qualities.





THE W. N. PISTON RING

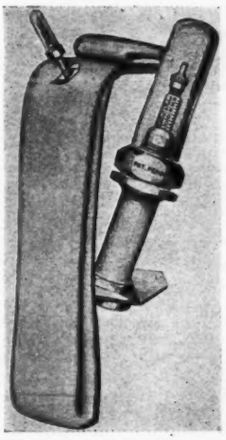
The W. N. Piston Ring has two grooves. These grooves make this ring really three rings in one, so that the service of three narrow rings instead of one is given. This gives three scraping edges each way, so that no surplus oil is left on the cylinder walls.

At the same time these two grooves allow just enough oil to be retained to insure an oil seal all around the ring, so that no oil can pass into the combustion chamber and no gas vapor escape from it.

The W. N. Piston Ring is a one-piece ring designed to be used either side up. Price, 60 cents each. The W. N. Mfg. Co., 180 Main Street, Manchester, Conn.

CLOVER LEAF TUBE WITH TIROMETER VALVE

The Clover Leaf Tube with Tirometer attached is manufactured by the Paul Rubber Co., Salisbury, N. C. The Tirometer shows the air pressure in the tire.



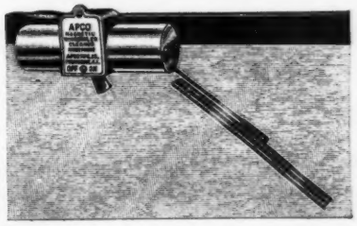
HERCULES SPARE TIRE PROTECTOR

This lock consists of a hinged clamp which fits around the spare tire and rim as shown, attaching them to the carrier by means of a pad-lock passed through both ends of the clamp and the bracket on the rim band of the tire carrier. The front part of the device is a malleable casting which takes the place of the regular wedge used to hold the rim and tire on the carrier. The hinged part is a band of high carbon steel. It is of black enamel finish and fits outside the tire cover. Price $1. Hercules Mfg. Co., Indianapolis.

APCO AUTOMATIC WINDSHIELD CLEANER

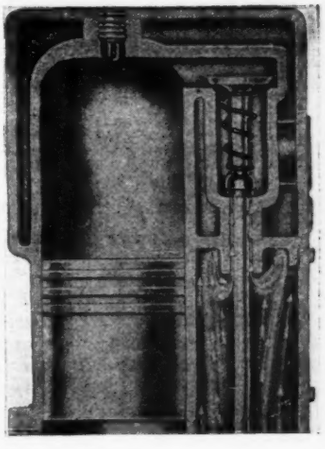
The Apco Mfg. Co., of Providence, R. I., have announced an automatic windshield cleaner that works on a new principle in that it uses magnets instead of the motor.

Among its features are its uniform high speed which does not vary with the speed of the car, it uses about 3 amperes, it can be installed on any car by drilling three holes in the windshield frame.



LINDBLOOM INTAKE VALVE PACKING

Lindbloom Intake Valve Packing serves to seal the combustion chambers from cold air. The illustration shows one installed and the current of the cold air being held from entering the combustion chamber. Lindbloom Auto Parts Co., 6958 S. State Street, Chicago.



COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Houston	South Texas Fair	Nov. 8-18
Jersey City	Third Annual Automobile Show	Nov. 11-18
Los Angeles	Automobile Show, Motor Car Dealers' Association	Nov. 11-18
Chicago	Annual Show of the Automotive Equipment Association	Nov. 13-18
Cincinnati, O.	Second Annual Automobile and Radio Exposition	Nov. 23-29
New York	Eighteenth Annual Automobile Salon	Dec. 3-9
New York	Annual Show	Jan. 6-13
New York	National Automobile Body Builders' Show	Jan. 8-13
Oakland, Cal.	Fifth Annual Show	Jan. 13-20
Cleveland, O.	Annual Winter Show, Cleveland Automobile M'f'r's' and Dealers' Assn.	Jan. 20-27
Chicago	Annual Show at Coliseum N. A. C. C.	Jan. 27-Feb. 3
Chicago	Annual Automobile Salon	Jan. 27-Feb. 3
Ann Arbor, Mich.		Jan. 29-Feb. 3
Minneapolis, Minn.	Annual Show	Feb. 3-10
Lansing, Mich.		Feb. 5-10
Kalamazoo, Mich.		Feb. 12-17
Flint, Mich.		Feb. 12-17
San Francisco	Exposition, Auditorium	Feb. 17-24
Gr'd Rapids, Mich.		Feb. 19-24
Mt. Clemens, Mich.		Feb. 19-24
Des Moines, Ia.	Annual Show	Feb. 23-Mar. 3
Brooklyn, N. Y.	Annual Automobile Show of the Brooklyn Motor Vehicle Dealers' Association	Feb. 24-Mar. 3
Muskegon, Mich.		Feb. 26-Mar. 3
Syracuse, N.Y.	Annual Automobile Show	Feb. 26-Mar. 3
Springfield, Mass.	Annual Automobile Show	Feb. 26-Mar. 3
Bay City, Mich.		Mar. 5-10
Newark, N. J.	Annual Automobile Show	Mar. 10-17
Port Huron, Mich.		Mar. 12-17
Battle Creek, Mich.		Mar. 19-24
Alpena, Mich.		Apr. 2-7

CONVENTIONS

Chicago	Annual Meeting Automotive Equipment Association	Nov. 13-18
Toledo	Annual Convention of the Ohio Automotive Trades' Assn.	Dec. 6-8

FOREIGN SHOWS

London	Annual Show	Nov. 3-11

RACES

Los Angeles, Calif.	Nov. 30
San Diego, Calif.	January

SQUEEKS & RATTLES

If You Know Any, Tell Them to Us

A knocking motor augurs something wrong
With inner mechanism, and I ween,
The man that's ever knocking all day long
Must needs have bits of carbon in his spleen.

'Ja ever notice that American ends in "Ican"?

"Hey you!" called the traffic cop to the lady driver who seemed uncertain as to her direction and destination, "What's the matter with you, anyway?"

"Well, officer," replied the lady, "you see I just had my car washed and I can't do a thing with it."—Tom Walsh.

God and reason make laws. Conscience is placed within you to show you the way of the law, so let conscience be your guide.

But be sure your radius rod is not loose.

—Bay City Motor News.

One index to a man's character is the condition of his automobile fenders.

"Pluck is the biggest essential in business, my son."
"Yes, but the trouble is in finding someone to pluck."
—Chicago Daily News.

AT THE GARAGE

"Mr. Jones is telephoning for his machine. Can you send it to him today?"
"Don't see how we can. It's the only one around here fit to use."
—Ohio Motorist.

REPAIR SHOP BLUES

The car runs like molasses,
The engine skips and chokes,
When the wheels are running fastest
You can almost count the spokes.
Repairmen say the trouble
Is just a valve that sticks.
I should have thought to oil it
And saved "four thirty-six."
The Louisville Courier-Journal.

WIFEY TELLS US THIS ONE

James came home from church with a happy smile. "Dad," he said, "'Sall right, they do have automobiles in heaven!"

"Great Scott, son, what put that fool idea into your head?"

"Straight stuff, Dad. They taught us a song in Sunday School today that says: 'If I love Him, when I die, He will take me home on high!"

Gittin' more outen a shop is considerable like gittin' more outen a jackpot—yeh gotta put more in.—Bill Gee.

Aw, Cut It Out

Judge Bean of a small western community was returning home the other day in his car. After being on the road for perhaps ten minutes, the judge happened to look at his speedometer and was almost knocked stiff when he perceived that he was making the speed limit look like a flock of daisies.

Assuming a stern attitude, the Judge drove up alongside of himself and, seizing his coat collar, took himself to court where he assessed himself a ten dollar fine and subjected his feelings to a severe hurt by reprimanding himself most vociferously.

BACK AT SCHOOL

"How did you spend your vacation this summer?"

"I had a position in my father's garage. And you?"

"I wasn't working either."—C. C. H.

HIGH COMEDY

Nervous Passenger (in aerial taxi about 5,000 feet up) —"Driver—what are—you laughing at?"

Driver—"I'm laughing at the superintendent. About this time, he'll be looking all over the lunatic asylum for me."—Life.

Mechanic: "Sir, I'd like my salary raised this week."

Boss: "Well, don't worry, I've managed to raise it every week so far, haven't I?"

A la Coue

The Coue method of autosuggestion is to say to yourself, "Every day and in every way, I am getting better and better."

Our notion of how this might apply to Germany is, "Every day and in every way, I am getting debter and debter."

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾–1	$1650a	3¾x5	34x5n	34x5n	W
Acason RB	1½	1950	3¾x5¼	36x3½	36x6	W
Acason H	2½	2750	4⅜x5¾	36x4k	36x8k	W
Acason L	3½	3450	4⅜x5¾	36x5k	36x10k	W
Acason M	5	4350	5 x6¼	36x6	40x12	W
Ace	1½–1½	2400	3½x5	34x3½	34x6	W
Ace 40	2	2850	4½x5¼	36x4	36x7	W
Ace 60	2½–3	3400	4½x5¼	36x4	36x8	W
Acme 20	1	....	3¾x5	35x5n	35x5n	W
Acme 30	1½	....	3¾x5	34x3½	34x5	W
Acme 40	2	....	3¾x5	34x3½	34x5	W
Acme 60	3	....	4½x5¼	36x4	36x7	W
Acme 60L	3	....	4½x5½	36x4	36x7k	W
Acme 90	4½	....	4½x5½	36x5	40x10	W
Acme 125	6¼	....	4¾x6	36x6	40x12	W
American 25	2½	3350	4 x6	36x4k	36x4dk	W
American 40	4	4275	4½x6	36x5k	36x5dk	W
American 50	5	4500	4½x6	36x5	36x12	W
Armleder 20	1	....	3¾x5¼	34x3½k	34x6k	W
Armleder 21	1½	....	3¾x5¼	34x3½k	34x6k	W
Armleder 40-B	1½	....	4¼x5½	34x3½k	34x6k	W
Armleder 40-C	1½	....	4½x5¼	34x3½k	34x6k	W
Armleder HW-B	2½	....	4¼x5½	36x4k	36x7k	W
Armleder HW-C	2½	....	4½x5¼	36x4k	36x7k	W
Armleder KW-B	3½	....	4½x6	36x5k	36x5dk	W
Armleder KW-C	3½	....	4½x5½	36x5k	36x5dk	W
*Atlas 22	1	1495	3¾x5⅛	34x4½n	34x4½n	W
*Atlas 44	1½–2	1950	3¾x5⅛	36x6n	36x6n	W
Atterbury 20R	1½	2475	3¾x5	34x3½	34x5	W
Atterbury 22C	2½	3375	4½x5¼	36x4	36x4d	W
Atterbury 22C	2½	3475	4½x5¼	36x4	36x4d	W
Atterbury 22D	3½	4275	4½x5½	36x5	40x5d	W
Atterbury 22D	3½	4375	4½x5½	36x5	40x5d	W
Atterbury 8E	5	4975	4¾x6	36x5	40x6d	W
Atterbury 8E	5	5125	4¾x6	36x5	40x6	W
\utocar 21UF	1½–2	2200	4¾x4½t	34x4k	34x6	D
Autocar 21UG	1½–2	2300	4¾x4½t	34x4k	34x6	D
Autocar 27H	2–3	3100	4 x5½	34x5	36x7	D
Autocar 27K	2–3	3200	4 x5½	34x5	36x7k	D
Autocar 26Y	4–6	4200	4½x5½	34x6	36x12	D
Autocar 26-B	4–6	4350	4½x5½	34x6	36x12	D
Available H1½	1½	2475	4 x5	36x3½k	36x5k	W
Available H2	2	2775	4 x5	36x3½k	36x6k	W
Available H2½	2½	3160	4 x5	36x4k	36x8k	W
Available H3½	3½	4175	4½x5½	36x5	40x5d	W
Available H5	5	5375	5 x6	36x6	40x12	W
*Avery	1	....	3 x4s	34x5n	34x5n	I
Beck A Jr.	1¼	1285a	3½x5	34x4½n	34x4½n	I
Beck B-30	1½	1350	3¾x5	34x5	36x6	
Beck C-40	2	1550	3¾x5	36x6	36x6	
Beck D-50	2½	1950	4½x5¼	38x7	40x8	
Bell M (Iowa)	1	1495	3⅝x5⅛	35x5	35x5n	W
Bell E (Iowa)	1½	2100	3¾x5¼	34x3½	34x5	I
Bell O (Iowa)	2½	2550	4½x5½	34x4	34x6	I
Bessemer G	1	....	3½x5	35x5n	35x5n	I
Bessemer H-2	1½	....	3¾x5	36x3½	36x5	D
Bessemer J-2	2½	....	4½x5¼	36x4	36x4d	D
Bessemer K-2	4	....	4½x5½	36x5	36x10	I
Bethlehem KN	1	1195	3½x5	35x5n	35x5n	B
Bethlehem GN	2	1795	4 x5½	34x4	34x6k	D
Bethlehem GN	3	2495	4 x6½	36x4k	36x8k	D
Bridgeport A	1½	....	3¾x5½	34x3½	34x6	W
Bridgeport B	2½	....	4½x5½	36x4	36x4d	W
Bridgeport C	3½	....	4½x6	36x5	36x10	W
Brinton C	2	2500	3¾x5	34x4	34x5	W
Brinton D	3	2975	4½x5¼	36x4	36x7	W
Brockway E	1	....	4 x5	33x5n	33x5n	B
Brockway S-5	1½	....	4 x5	36x4	36x6	W
Brockway SK	1½	....	4½x5¼	36x4	36x6	W
Brockway KR	2½	....	4½x5½	36x4	36x8	W
Brockway K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway RT	3½	....	4¾x6	36x5	36x10	W
Brockway R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway T-4	5	....	4¾x6	36x6	40x6d	W
*Buick	½	945b	3⅝x4¾	31x4n	31x4n	B
Case	2	....	4¼x5¾	36x6	38x7	I
*Chevrolet	¼	510b	3⅛x4	30x3½n	30x3½n	B
*Chevrolet G	¾	650	3⅛x4	34x4n	34x4½n	B
*Chevrolet T	1	1095	3⅛x5¼	33x4n	35x5n	W
Chicago C1½	1½	....	4 x5	36x3½k	36x5k	W
Chicago C2½	2½	....	4 x5	36x4k	36x7k	W
Chicago C3½	3½	....	4½x5½	36x5	36x10	W
Chicago D5	5	....	4½x5½	36x6	40x12	W
Clydesdale 10	¾–1½	1485	3¾x5	34x5n	34x5n	B
Clydesdale 10A	¾–1½	1535	3¾x5	34x5n	34x5n	B
Clydesdale 18	¾–1½	1890	3¾x5	34x5	34x5	W
Clydesdale 20	1–1½	2385	3¾x5	34x5	34x5k	W
Clydesdale 42	1½–2	2475	3¾x5	36x3½	36x6	W
Clydesdale 65X	2½–3	3250	4½x5¼	36x4	36x8	W
Clydesdale 65EX	2½–3	3450	4½x5½	36x4	36x8	W
Clydesdale 90	3½–4½	4100	4½x5½	36x5	36x10	W
Clydesdale 120	5–6	4500	4¾x6	36x6	40x12	W
Comet T	1½	1950	3¾x5	34x4	34x4	W
Commerce 9	¾–1½	1150	3¾x5	32x4½n	32x4½n	B
Commerce T	¾–1½	1450	3¾x5	34x4½n	34x4½n	B
Commerce 10	¾–1½	2500	3¾x5	33x5n	33x5n	B
Commerce 12	1½	1695	3¾x5	34x3½	34x4	I
Commerce 12	1½	1800	3¾x5	35x5n	35x5n	I
Commerce 16	2	1995	3¾x5	34x4	34x6	I
Commerce 16	2	2150	3¾x5	35x5n	36x6n	I
Commerce 18	2½	2150	4¼x5¼	36x4	36x7	I
Commerce 18	2½	2495	4¼x5¼	36x4	36x7	I
Commerce 25	2½	2495	4½x5¼	36x4	36x7	W
Commerce 25	2½	2770	4½x5¼	36x6	40x8n	W
Cook 51	2½	3600	4 x5⅛	36x6n	40x8n	W
*Corbitt	¾–1	1250	3½x5	33x5n	33x5n	
Corbitt E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt D-22	1½	2200	3¾x5	34x3½	34x5	W
Corbitt C-22	2	2600	4½x5¼	36x3½	36x7	W
Corbitt B-22	2½	3000	4½x5¼	36x4	36x7	W
Corbitt R-22	3	3200	4½x5½	36x4	36x8	W
Corbitt A-22	3½–4	3800	4½x5½	36x5	36x10	W
Corbitt AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder AS	1	1600	3¾x5	35x5n	35x5n	W
Day-Elder B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder D	2	2400	4½x5¼	36x4	36x7	W
Day-Elder C	2½	2750	4½x5½	36x4	36x7	W
Day-Elder F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder E	5	4250	4½x6	36x5k	40x6dk	W
Dearborn E	1	1600	3⅝x5⅛	35x5n	35x5n	W
Dearborn FX	1½	2300	3¾x5½	34x4	34x5	W
Dearborn F	1½	2180	3¾x5½	34x4	34x5	W
Dearborn 48	2	2590	3¾x5½	34x4½n	34x7	W
Defiance G	1	1525	3¾x5	35x5n	35x5n	B
Defiance D	1½	1845	3¾x5	35x5n	36x6n	I
Defiance E	2	2075	3¾x5	35x5n	38x7n	I
Denby 31	1¼	1485	3¾x5	35x5n	35x5n	B
Denby 33	1½	2145	3¾x5	35x5n	38x7n	I
Denby 35	2½–3	2795	4½x5¼	36x4	36x7	I
Denby 27	4	3895	4½x5½	36x5	36x5d	I
Denby 210	5	4295	4½x5½	36x6	40x6d	I
Dependable A	¾–1	1650	3⅝x5⅛	34x5n	36x6n	W
Dependable C	2	2350	3¾x5¼	34x3½	34x5	W
Dependable D	2½	2650	4 x5½	34x5	36x6	W
Dependable E	3	2950	4½x5½	36x4	36x7	W
Diamond T O-3	1–1¼	1975	3¾x5¼	36x3½n	36x4n	W
Diamond T T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T U	2–2½	2650	4 x5¼	36x4	36x7	W
Diamond T K	3½	3750	4½x5½	36x5	36x5d	W
Diamond T EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T S	5	4500	4¾x6	36x6	40x6d	W
Doane	2½	4100b	4½x5¾	36x5	36x7	C
Doane	3½	5100b	4⅜x5¾	36x5	36x5d	C
Doane	6	6000b	5 x6¼	36x6	40x6d	C
*Dodge Brothers	¾	730	3⅞x4½	32x4n	32x4n	B
Dorris K-2	1	2490	4 x5½	33x5n	33x5n	B
Dorris K-4	2–2½	3400	4½x5½	36x4	36x7	W
Dorris K-7	3½	4400	4½x5½	36x5	36x10	W
*Dort	½	685a	3½x5	31x4n	34x4n	B
Double Drive B	3	4000	4½x5½	36x6	36x6	W
Duplex A	2	2775	4 x5½	35x5n	38x7n	W
Duplex E	3½	3500	4½x5½	36x8	36x8	I
Duty 22	2	1590	3½x5	34x3½	34x5	I
Eagle 101	1½	1875	3⅝x5⅛	34x5	34x5	I
Eagle 100-2	2	2275	3¾x5¼	34x4k	34x7k	I
F. W. D. B	3	4200	4⅜x5½	36x6	36x6	B
Fageol 1½	1½	3000	3¾x5¼	34x3½k	34x6k	W
Fageol 2½	2½	3900	4⅜x5¾	34x4	36x7	W
Fageol 3½	3½	5000	4½x6¼	36x5k	40x5dk	W
Fageol 5	5	5700	4½x6¼	36x6	40x6d	W
Fargo R	2	1700	3¾x5	36x4	36x6	I
*Federal	1½	1375	3¾x5	—x5n	—5n	
Federal SD	1½	1800	3¾x5	35x5n	36x6n	W
Federal TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal UE	2–2½	2425	4½x5¼	36x4	36x7	W
Federal WE	3½–4	3150	4½x5½	36x5	36x5d	W
Federal X2	5–6	4500	4¾x6	36x6	40x6d	W
*Ford TT	1	380	3¾x4	30x3½n	32x4½n	W
Front Drive C	1½	2800	3¾x5½	36x6	36x6	W
G.M.C. K16	1	1235	3½x5½	34x5n	34x5n	B
G.M.C. K-41A	2	2375	4 x5½	36x4k	36x7k	W
G.M.C. K-41B	2	2375	4 x5½	36x4k	36x7k	W
G.M.C. K-41T	5†	2450	4 x5½	36x4	36x8	W
G.M.C. K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C. K-71B	3½	3700	4½x6	36x5	40x5d	W
G.M.C. K-71T	10†	3700	4½x6	36x5	40x12	W
G.M.C. K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C. K-101T	15†	4050	4½x6	36x5	40x14	W
G.M.C. K-101B	5	4050	4½x6	36x5	40x6d	W
G.W.W.	1½	1850	3¾x5½	35x5	35x5	I
*Garford 15	1	1590	3⅝x5⅛	34x5n	34x5n	W
Garford 25-B	1½	1990	3¾x5½	36x3½	36x5	W
Garford 70-H	2½	2750	4½x5½	36x4	36x8	W
Garford 77-D	4	3750	4½x6	36x5	36x5d	W
Garford 68-D	5	4500	5 x6½	36x6	40x5d	W
Garford 150-A	7½	5200	5 x6½	36x6	40x7d	C
Gary F	1–1½	1775	3¾x5	36x3½	36x5	W
Gary 1	2	2450	4 x5½	36x3½	36x6	W
Gary J	2½	2850	4½x5½	36x4	36x8	W
Gary K	3½	3790	4½x6	36x5	40x5d	W
Gary M	5	4450	5 x6½	36x6	40x6d	W
Gersix M	1½	3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gersix	3½	4500	4½x6	36x5	40x12	W
Gotfredson 20	1	2075	3¾x5½	34x5	34x5	W
Gotfredson 31	1½–2	3000	4 x5½	36x6	38x7n	W
Gotfredson A	2½	3375	4 x5½	36x4	36x7	W
Gotfredson B	3½–4	4475	4½x5½	36x5	36x10	W
Gotfredson 100	5–6	5500	5 x6½	36x6	40x14	W
Graham Bros.	1	1265	3⅞x4½	33x4½n	34x5n	B
Graham Bros.	1½	1325	3⅞x4½	33x4½n	36x6n	B
[1]Gramm-Pion. 10	1	1245	3½x5	33x5n	33x5n	B
[1]Gramm-Pion. 15	1½–2	1750a	3¾x5	36x3½k	36x5k	I
[1]Gramm-Pion. 65	1½–2	2250a	3¾x5	36x3½k	36x5	W
[1]Gramm-Pion. 20	2–2½	2475a	4½x5¼	36x4k	36x7k	W
[1]Gramm-Pion. 30	3	3300a	4½x5½	36x5k	36x5dk	W
[1]Gramm-Pion. 75P	3½	4225a	4½x5½	36x6n	42x9n	W
[1]Gramm-Pion. 40	4	3850a	4½x5½	36x5	36x5dk	W
[1]Gramm-Pion. 50	5–6	4450a	4¾x6	36x6	40x6dk	W
Hall 1½	1½	3100	3¾x5	34x5n	38x7n	W
Hall 2½	2½	3275	4½x5¼	36x4	36x6	W
Hall 3½	3½	4100	4½x5½	36x5	36x5d	W
Hall 5	5	5100	4½x5½	36x5	40x6d	W
Hall 7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey W OA	2	2650	4½x5½	34x4	34x7	W
Harvey WFA	2½	2950	4½x5½	36x4	36x7	W
Harvey WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye O	1	1375	3⅝x5⅛	34x5n	34x5n	
Hawkeye K	1½	1645	3¾x5½	34x3½k	34x5k	I
Hawkeye M	2	2145	4¼x5	36x4k	36x6k	I
Hawkeye N	3½	3700	4½x6¾	36x5k	36x10k	I
Hendrickson O	1½	2200	3⅝x5½	36x4n	36x5n	W
Hendrickson N	2½	2690	4¼x5¾	36x4k	36x7k	W
Hendrickson M	3½	3000	4¼x5	36x5k	36x5dk	W
Hendrickson K	5	4000	5 x6¼	36x6	40x6	W
Huffman B	1½–2	1795	3¾x5	34x3½	34x6	W
Huffman C	1½–2	1695	3¾x5½	36x3½	36x6	I
Huffman D	2–3	2895	4½x5½	36x4	36x7	
Hurlburt A-A	1–1½	1950	3¾x5	34x5n	34x5n	W
Hurlburt B-B	2–2½	2800	4½x5½	36x4	36x4d	W
Hurlburt C-C	3–3½	3475	4½x5½	36x5	36x5d	W
Hurlburt D-D	4–4½	4150	4½x6	36x5	36x6d	W
Hurlburt E-E	6–6½	4850	4¾x6½	36x6	40x6d	W
Indep'd't(Iowa) B	1	1665	3½x5	34x3½	34x4	I
Indep'd't(Iowa) G	1½	2040	3¾x5½	34x3½	34x5	I
Indep'd't(Ia.) H	2½	2940	4½x5½	36x4	36x7	I
*Indiana 10	1	....	3¾x5½	34x5n	34x5n	B
Indiana 12	1½–2	....	3¾x5½	34x3½k	34x5k	W
Indiana 20	2	....	4½x5½	36x4k	36x7k	W
Indiana 25	2½–3	....	4½x5½	36x4k	36x8k	W
Indiana 35	3½–4	....	4⅜x5½	36x5k	36x5dk	W
Indiana 51	5–7	....	5 x6¼	36x5k	40x6dk	W
*International S	1	1250	3½x5	32x4½n	32x4½n	I
International 21	1	1550	3½x5¼	36x3½k	36x3½	I
International 31	1½	1650	3½x5¼	36x3½k	36x5k	I
International 41	2	2100	3½x5¼	36x3½k	36x6k	I
International 52	2½	3500	4¼x5	36x6n	36x6dn	I
International 61	3	2400	4¼x5	36x4k	36x7k	I
International 62	3	2600	4¼x5	36x4	36x7	I
International 101	5	3600	4¼x5	36x5	40x12k	I
International 102	5	3800	4¼x5	36x5	36x12	I
Jackson 4WD	3½	3850	4½x5½	36x7	36x7	B
K-Z 1	1	1750	3½x5	34x3½	34x5	W
K-Z 1½	1½	2075	3¾x5	36x4	36x6	W
K-Z 2½	2½	2550	4½x5¼	36x4	36x8	W
K-Z 3½	3½	3350	4½x5½	36x5	40x10	W
K-Z 5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo T	1	1295	4 x5	34x5	34x5n	B
Kalamazoo G-1	1½	1800	3¾x5	34x4	31x5	W
Kalamazoo LG	2	2645	4 x5	36x4	36x7	W
Kalamazoo NH	3	3145	4 x6	36x5	36x10	W
Kalamazoo HD	3	3350	4¼x6	36x5	36x10	W
Kalamazoo SK	4	3845	4¼x6	36x5	36x12	W
Kalamazoo OK	5	4350	4½x6	36x6	40x6d	W
[2]Kelly-S. K-31	1½	2700	3¾x5¼	36x3½	36x6	C
[2]Kelly-S. K-34	1½	2700	3¾x5¼	36x3½	36x6	W
[2]Kelly-S. K-38	2½	2900	3¾x5¼	36x4	36x4d	W
[2]Kelly-S. K-35	2½	2900	3¾x5½	36x4	36x4d	C
[2]Kelly-S. K-40	3½	3900	4½x5½	36x5	40x5d	C
[2]Kelly-S. K-41	3½	3900	4½x6½	36x5	36x10	I
[2]Kelly-S. K-42	3½	3900	4½x6½	36x5	40x5d	W
[2]Kelly-S. K-50	5	4400	4½x6½	36x6	40x6d	C
[2]Kelly-S. K-60	6	4600	4½x6½	36x6	40x7d	C
[2]Kelly-S. K-61	5–7	4800	4½x6½	36x6	36x7d	I
Kimball AB	2	3675	4 x6	36x4	36x7	W
Kimball AC	2½	3975	4¼x6	36x4	36x8	W
Kimball AK	3	4500	4½x6	36x4	36x10	W
Kimball AE	4	5000	4¾x6	36x5	40x12	W
Kimbal AF	5	5500	5 x6	36x6	40x7d	W
*Kissel Express	1	1585	3⅞x5½	34x5n	34x5n	W
Kissel Utility	1½	1975	3⅞x5½	36x3½	36x6	W
Kissel Freighter	2½	2875	4¼x5½	36x4	36x8	W
Kissel H.D.	4	3675	4¼x5½	36x5	36x12	W
Kleiber AA	1	2200	4½x5¼	34x3½k	34x5k	W
Kleiber A	1½	3100	4½x5¼	36x3½k	36x6k	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—express truck or delivery wagon. **—Canadian Make. trac.—tractor. †Capacity with semi-trailer.

1—Gramm Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kleiber.....BB	2	$3600	4½x5½	36x4k	36x7k	W
Kleiber.....B	2½	3950	4½x5½	36x5k	36x8	W
Kleiber.....C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber.....D	5	5300	5 x8½	36x6	40x12	W
Koehler.....D	1½	2150	3½x5	34x3½	34x5	W
Koehler.....M	2½	3175	4 x5½	36x4	36x7	W
Koehler.....MCS	2½	3275	4 x5½	36x4	36x7	W
Koehler.....F	3½	4470	4½x5½	36x5	36x10	W
Koehler,MT.Trac	5	3275	4 x5½	36x4	36x7	W
Krebs.....23	¾	1360	3¾x5	34x4½	34x4½	B
Krebs.....24	1	1675	3¾x5	34x5	34x5	W
Krebs.....45	1½	2275	4½x5½	36x4	36x7	W
Krebs.....75	2½	2550	4½x5½	36x4	36x8	W
Krebs.....110	3½	3175	4½x5½	36x5	40x10	W
Krebs.....140	5	....	4¾x6	36x6	40x6d	W
Larrabee.....X-2	1	1925	3¼x4½	34x5n	34x5n	B
Larrabee.....U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee.....J	1½–2½	2400	3¾x5	34x3½k	34x5k	W
Larrabee.....K	2½–3	3100	4½x5½	36x4	36x7	W
Larrabee.....K-5	2½–3½	3450	4½x5½	36x4	36x8	W
Larrabee.....L-4	3½–5	4000	4½x5½	36x5	36x5d	W
Larrabee.....W	5–7	4800	4¾x6	36x6	40x6d	W
Maccar.....L	1½	....	4½x5½	36x4	36x6	W
Maccar.....H-A	2	....	4½x5½	36x4	36x4d	W
Maccar.....H-2	3	....	4½x5½	36x4	36x5d	W
Maccar.....M-3	4	....	4½x5½	36x5	36x6d	W
Maccar.....G	5–6	....	4¾x6	36x5	40x6d	W
MacDonald.....A	7½	5750	4½x6	40x7	40x14	I
Mack....AB D.R.	1½	3450	4 x5	36x4k	36x3½dk	D
Mack....AB Chain	1½	3000	4 x5	36x4k	36x3½dk	D
Mack....AB Chain	2	3300	4½x5	36x4k	36x4dk	C
Mack....AB D.R.	2	3750	4½x5	36x4k	36x4dk	D
Mack....AB D.R.	2½	3850	4½x5	36x4k	36x4dk	D
Mack....AB Chain	2½	3400	4½x5	36x4k	36x4dk	C
Mack....AC Chain	3½	4950	5 x6	36x5k	40x5dk	C
Mack....AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack....AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack....AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac....AB	5	3400	4½x5	36x4	36x4d	C
Mack Trac....AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac....AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac....AC	13	5750	5 x6	36x6	40x12	C
Mack Trac....AC	15	6000	5 x6	36x7	40x7d	C
*Mapleleaf.....**	1½	3000	3¾x5½	34x5n	36x6n	W
Mapleleaf....AA**	2	3600	4 x5½	36x4	36x7	W
Mapleleaf....BB**	3	4050	4½x5½	36x4	36x4d	W
Mapleleaf....CC**	4	4800	4½x5½	36x5	36x5d	W
Mapleleaf....DD**	5	5625	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x6	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2890	4½x5½	34x4	36x8	W
Master.....DD	2½	3190	4½x5½	34x4	36x7	D
Master.....A	3½	3990	4½x6	36x5	40x8	W
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3390	4½x5½	34x4	36x7	D
*Maxwell.....1½	1½	932	3⅝x4½	32x3n	32x4n	W
*Menominee.....	1	1650	4 x5	34x5n	34x5n	W
Menominee....HT	1–1¼	2000	3¾x5	34x3½	36x5	W
Menominee....H	1½	2475	4 x5	36x3½	36x5	W
Menominee....D	2–2½	2875	4 x5	36x4	36x8	W
Menominee....G	3½	3809	4½x6	36x5	36x10	W
Menominee....J-3	5	4250	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5n	36x6n	I
[3]Moreland..R. R.	1	1595	4 x5	34x5n	34x5n	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6k	W
Moreland.....EX	2	2800	4½x5½	36x4	36x7k	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10k	W
Moreland.....RX	4½–5	4600	4¾x6	36x6	40x6	W
Nash.....2018	1–1½	1595	3¾x5½	34x4	34x5	I
Nash.....3018	2–2½	2150	3¾x5½	34x4k	34x7k	I
Nash.....Quad.	2–2½	2750	4½x5½	36x6	36x5k	I
Nash. 3018, LWB	2–2½	2200	3¾x5½	34x4k	34x7k	I
Nash. Quad. LWB	2–2½	2800	4½x5½	36x6	36x6	I
Nash.....5018	2½	2250	3¾x5½	34x4k	34x7k	I
[4]Nelson.....G2	1½	....	4½x5½	36x3½	36x6	W
[4]Nelson.....G3	2½	....	4½x5½	36x4	36x7	W
[4]Nelson.....G4	3½	....	4½x5½	36x5	36x5d	W
[4]Nelson.....G5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5½	36x4k	36x7k	W
Netco.....HL	2½	3500	4½x5½	36x4k	36x8k	W
Niles.....E	2	3000	4½x5½	36x4k	36x7k	W
Noble.....A21	1¼	1750	3½x5½	34x5	34x5	W
Noble.....B31	1½–2	2395	3¾x5½	36x4	36x7	W
Noble.....D51	2½–3	2795	4½x5½	36x4	36x8	W
Noble.....E71	3½–5	3495	4½x6	36x5	36x10	W
Noble.....B30	1½	....	3¾x5½	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4½x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northwestern..W	1½	2700	4½x5½	34x4	36x6	W
Northwestern.WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk.....2SE	1	1595	3½x5	34x3½	34x4	W
Norwalk.....3SE	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,3SE.Spec	1½	2285	3¾x5½	34x3½	34x5	W
Ogden.....A2	1	....	3½x5	34x5n	34x5n	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5½	36x4	36x8	W
Old Hickory...W	1	$1775	3¾x5	36x3½k	36x4k	W
Old Reliable....A	1½	2350	4 x5	34x4	36x6	W
Old Reliable....B	2½	3500	4½x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4½x6	36x5	36x5d	W
Old Reliable....D	5	5000	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6½	36x6	40x7d	C
*Oldsmobile Econ	1	1095	3½x5½	35x5n	35x5n	I
Olympic.....A	2½	3200	4½x5½	36x4	36x8	W
Oneida.....B9	1½	2825	4 x5½	36x3½	36x7	
Oneida.....C9	2½	3200	4 x5½	36x4	36x8	
Oneida.....D9	3½	4050	4½x5½	36x5	36x10	
Oneida.....E9	5	4725	4½x5½	36x6	40x12	
Oshkosh.....A	2	2485	3½x5	36x6n	36x6n	B
Oshkosh.....AA	2	2585	3½x5	36x6n	36x6n	B
Oshkosh.....B	2½	3485	4 x5½	38x7n	38x7n	B
Oshkosh.....BB	2½	3585	4 x5½	38x7n	38x7n	B
*Overland.....4	½	425	3½x4	30x3½n	30x3½n	B
Packard.....EC	2–3	3100	4½x5½	36x4	36x7	W
Packard.....EX	2–2½	3100	4½x5½	36x6n	40x8n	W
Packard.....ED	3½x4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	5–7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5½	34x3½	34x5	W
Paige.....54-20	2½	2420	4½x5½	34x4	34x8	W
Paige.....51-18	3½	3145	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5½	34x5n	34x5n	W
Parker.....G-22	2½	3200	4½x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot.....Revere	1	1380	3¾x5	35x5n	35x5n	W
Patriot.....Lincoln	2	2050	4 x5½	34x4	34x6	W
Patriot.....LS-800	2	2175	4 x5½			
Patriot..Washgt'n	3	2900	4½x5½	36x5	36x7	W
Pierce-Arrow.....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow.....	3½	4350	4½x6¾	36x5	36x5d	W
Pierce-Arrow.....	5	4850	4½x6¾	36x5	40x6d	W
Pittsburgher.....	1½–2	3000	3¾x5	36x4	36x6	
Pittsburgher.....	3	3800	4½x5½	36x5k	36x7	W
Power.....F	2	3150	4 x5½	36x5	36x7	W
Power.....C	3½	....	4½x5½	36x5	40x10	W
Premocar...B-143	1½	2475	3½x5	36x6n	36x6n	W
*Rainier.....R-21	¾	....	3½x5	35x5n	35x5n	W
Rainier.....R-29	1	....	3¾x5	34x3½	34x4	W
Rainier.....R-26	1½	....	3¾x5	34x3½	34x5	W
Rainier.....R-28	2	....	4½x5½	34x4	34x6	W
Rainier.....R-20	2½–3	....	4½x5½	34x4	34x7	W
Rainier.....R-15	3½–5	....	4½x5½	36x5	36x5d	W
Rainier.....R-25	3½–5	....	4½x5½	36x5	36x5d	W
Rainier.....R-17	5–6	....	4½x6	36x6	40x6d	W
Rainier.....R-27	6	....	4¾x6	36x6	40x6d	W
Ranger...TK-20-2	1½	1450	3¾x5	36x6n	38x7n	W
*Reo.....F	¾–1½	1185	4½x4½	34x4½n	34x4½n	B
Reliance.....10A	1½	2400	4 x5½	36x3½	36x5	I
Reliance.....20B	2½	3100	4½x5½	36x4	36x4d	I
Republic.....75	¾	1395b	3½x5	32x4½n	32x4½n	I
Republic.....10	1	1395	3¾x5	34x3	34x4	I
Republic...10 Exp	1	1695	3¾x5	34x5n	34x5n	I
Republic.....11X	1½	1795	3¾x5	34x4	34x6	I
Republic.....19	2½	2195	4½x5½	36x4	36x7	I
Republic.....20	3½	3095	4½x5½	36x5	36x10	I
Rowe.....CW	1½	3000	3¾x5	36x6n	36x6n	W
Rowe.....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe.....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe.....G.P.W.	3	5250	3¼x5r	38x7n	42x9n	W
Rowe.....HW	4	4500	4½x6	36x5	36x6d	W
Rowe.....F.W.	5	4850	4½x6	36x6	40x6d	W
Ruggles.....20	1	1195	3¾x5	34x5n	34x5n	B
Ruggles.....40	2	1795	4 x5	34x5n	34x7	D
Samson.....15	¾	....	4–3½x4	32x4n	32x4n	B
Samson.....25	1¼	....	4–3½x5½	35x5n	35x5n	B
Sanford....W-15	1½–2	2150b	3¾x5	36x3½k	36x5k	
Sanford.....25	2½–3½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½–5	....	4½x5½	36x5	36x5d	W
Sanford.....50	5–7	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4½x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4½x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz.....A	1	1685	3½x5	34x4½n	34x4½n	B
Schwartz.....K	2	3000	3¾x5½	34x3½	34x7	W
Schwartz.....L	3	3600	4½x5½	36x4	36x8	W
Schwartz.....M	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½–2½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½–2½	3350	4½x5½	34x5n	38x7n	W
Selden.....50	2½–3½	3250	4½x5½	36x4	36x7	W
Selden.....51	2½–3½	4350	4½x5½	36x6n	40x8n	W
Selden.....70	3½–5	$3750	4½x5½	36x5	36x10	W
Selden.....90	5–7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½n	30x3½n	B
*Service.....12	¾	....	3¼x4½	32x4½n	32x4½n	B
*Service.....25	1¼	....	3¾x5½	34x5n	34x5n	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4½x5½	35x5n	38x7n	W
Service.....52	3	....	4½x5½	36x4	36x8	W
Service.....72	3½	....	4½x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W
Signal.....NF	1	1450	3¾x5	34x5n	36x6n	W
Signal.....H	1½	1950	4½x5½	34x4	36x6	W
Signal.....J	2½	2375	4½x5½	34x4	36x8	W
Signal.....M	3½	3175	4½x5½	36x5	40x5d	W
Signal.....R	5	3900	4¾x6	36x6	40x6d	W
*Standard.....75	1¼	1330	3¾x5	33x5n	33x5n	W
Standard....1-K	1½	1600	3¾x5	34x3½k	34x5k	W
Standard.....76	2½–3	2400	4½x5½	36x4k	36x8	W
Standard.....66	3½–5	3150	4½x5½	36x5	36x12	W
Standard....5-K	5–7	4400	4¾x6	36x6	40x14	W
*Star.....	½	610b	3½x4½	30x3½n	30x3½n	
Sterling.....1½	1½	2885	4 x5¾	36x3½k	36x5k	W
Sterling.....2	2	3085	4 x5¾	36x4k	36x6k	W
Sterling.....2½	2½	3290	4½x5¾	36x4k	36x4dk	W
Sterling.....3½	3½	4325	4½x6¼	36x5k	40x5dk	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
*Stewart...Utility	¼–1½	1245	3¾x4½	34x4½n	34x4½n	I
Stewart.....	1½–1¾	1445	3¾x5½	35x5n	35x5n	I
Stewart.....9	1½–2	1790	3¾x5	34x3½	34x6	I
Stewart.....7-X	2½–3	2390	4¼x5½	34x4	34x8	I
Stewart.....10-X	3½–4	3190	4½x6	36x5	36x10	I
*Stewart.....	1¼	1245	4–3½x5½	34x4½	34x4½	
*Stoughton.....C	¾	1095	3½x5	34x4½n	34x4½n	B
Stoughton.....A	1	1790	3¾x5¼	34x5n	34x5n	W
Stoughton.....B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton.....D	2	2490	4 x5½	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4k	36x7k	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
*Thomart.....	1¼	1795	4 x5¼	34x5	34x5	C
Tiffin.....GW	1½	2100	4¼x5¼	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5¼	36x4	36x3½d	W
Tiffin.....PW	3½	3600a	4½x5½	36x5	40x5d	W
Tiffin.....PW	5	4300	4½x6	36x6	40x6d	W
Tiffin.....UW	6	4500	4¾x6	36x6	40x12	W
Titan.....	2	2750	4 x5	36x4k	36x7k	D
Titan.....	2½	2950	4¼x5½	36x4k	36x8k	D
Titan.....	3½	3950	4½x6	36x5k	40x10k	D
Titan.....	5	4550	4½x6	36x5	40x12	D
Tower.....J	1½	2000	4½x5¼	35x5n	38x7n	W
Tower.....H	2½	2475	4½x5¼	36x4	36x7	W
Tower.....G	3½	3475	4½x5½	36x5	36x5d	W
Traffic.....	1½	1595a	3¾x5	35x5n	35x5n	I
Traffic.....C	2	1595a	3¾x5	34x3½k	34x5k	I
Traffic.....	3	1895a	3¾x5	36x4	36x7	I
*Transport.....15	1	1295	3¾x5	32x4½n	32x4½n	B
Transport.....25	1½	1495	3¾x5½	34x3½k	34x5k	I
Transport.....35	2	1885a	3¾x5	36x3½k	36x6k	I
Transport.....55	3	2385	4¼x5½	36x4k	36x8k	I
Transport.....60	3½	2585	4¼x5½	36x4k	36x8k	I
Transport.....75	5	3485	4½x6	36x5k	36x12k	I
Traylor.....B	1½	2390	3¾x5½	34x3½	34x5	W
Traylor.....C	2–2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3–3½	3300	4¼x5½	36x4	36x8k	W
Traylor.....F	5–6	4700	4½x6	36x6	40x6d	W
*Triangle.....AA	1	1285	3¼x5	34x4½n	34x4½n	I
Triangle.....A	1½–2	1985	3¾x5¼	34x3½k	34x6k	I
Triangle.....C	2–2½	2285	3¾x5½	36x4k	36x7k	I
Triangle.....B	2½–3	2585	4 x5¾	36x4k	36x7k	I
Twin City...B.W.	2	2400	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3500	4¼x6	36x5	40x5d	W
[5]Twin City.....B	3½	....	5½x6	36x6	36x6	I
[5]Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.....AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6¼	36x6	40x12	W
United.....A	1½	2445	3¾x5¼	36x3½k	34x5k	W
United.....B	2½	3150	4¼x5½	36x4k	36x7k	W
United.....C	3½	3975	4¼x5½	36x5	36x5d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
*United States..U	1¼	1800	3¾x5½	34x5n	34x5n	B
UnitedStates..NW	1½–2	2375	3¾x5	36x5	36x3½	W
United States...N	1½–2	2175	3¾x5	36x3½k	36x5k	I
United States...R	3	3300	4 x5¼	36x4	36x4d	W
United States...S	4	4075	4½x5½	36x5	36x5d	W
United States...T	5–7	4975	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½k	36x5k	I
Velie.....53	2½	2185	4 x5½	36x4k	36x7k	I
Veteran.....M**	1½	2699	3¾x5¼	35x5n	35x5n	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.

r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—express truck or delivery wagon. **—Canadian Make. trac.—tractor.

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Veteran.....P**	2	$3699	4½x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x8	36x5	36x10	W
*Vim.....50	½-¾	995	4 x5	32x4n	32x4n	B
Walker-JohnsonA	2	2500	3¾x5	34x3½	34x6	W
Walker-JohnsonB	3	3000	4¼x5½	36x4	36x8	W
Walter.....M	2½	3850	4½x5¾	36x4	36x8	D
Walter.....S	5	4850	4½x6¼	36x6	40x6d	W
*Watson.....C	1	1465a	3½x5½	35x5n	35x5n	W
Watson.....N	3½	4250	4½x5½	36x5	36x10	W
Western....W1½	1½	2450	4½x5¾	36x3½k	36x5k	W
Western....L1½	1½	2450	3¾x5	36x3½k	36x5k	W
Western....W2½	2½	3250	4½x5¾	36x4	36x7	W
Western....L2½	2½	2450	4¼x6	36x4	36x7	W
Western....W3½	3½	4000	4½x6	36x5	40x5d	W
*White.....15	¾	2400	3¾x5½	34x5n	34x5n	B
White.....2a	2	3250	3¾x5½	36x4k	36x7k	D
White.....40	3½	$4200	3¾x5¾	36x5	40x5d	D
White.....45	5	4500	4¼x5¾	36x6	40x6d	D
White Hick.....E	1	1225	3¼x5	34x5n	34x5n	W
White Hick.....H	1½	1375	3¼x5	36x3½	36x5	W
White Hick.....K	2½	1675	4½x5¼	36x4	36x5	W
Wichita.....K	1	1875	3¼x5½	36x3½	36x4k	W
Wichita.....M	2	2400	3¼x5½	36x3½k	36x6k	W
Wichita.....RX	3	3200	4½x5¾	36x4k	36x8k	W
Wichita.....O	4	$3500	4½x6½	36x5k	36x5k	W
Wilcox.....AA	1	1900	3¾x5½	36x4k	36x4k	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3000	4¼x5	36x4k	36x3½dk	W
Wilcox.....E	3½	3950	4½x6	36x5k	36x5dk	W
Wilcox.....F	5	4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¾x5	36x3½	36x5	W
Wilson.....EA	2½	2825	4½x5¼	36x4	36x7	W
Wilson.....G	3½	3685	4½x5½	36x5	36x5	W
Wilson.....H	5	4520	4¾x6	36x6	40x6	W
*Wisconsin.....A	1	1750	3¾x5	34x5n	34x5n	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	4 x5¾	36x6n	36x7	W
Wisconsin.....D	3½	3000	4¾x5¾	36x6n	40x8	W
Wisconsin.....E	5	3500	4½x6¼	36x6	36x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2450	3¾x5	36x3½k	36x6k	W
Witt-Will.....P	2½	2900	4½x5¼	36x4k	36x8k	W

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Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders; Bore, Stroke	Fuel	Plow Capacity
Allis-Chal.G.P.	6-12	$250	2	LeR.	4-3½x4½	Gas.	1
Allis-Chalm...	15-25	1185	4	Midw.	4-4½x5¼	Gas.	3
Allis-Chalm...	20-35	1885	4	Own	4-4¾x6½	GorK	3-4
‡Allis-Chalm.	20-35	2085	4	Own	4-4¾x6½	G	4
Allwork....2-G	14-28	1595	4	Own	4-4¾x6	GorK	3
Allwork.....C	14-28	1395	4	Own	4-5 x6	GorK	3
¶ARO.1021-22	3-6	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	1900	4	Clim.	4-5 x6½	G,K,D	4
Aultman-T....	22-45	2800	4	Own	4-5½x8	G,K,D	6
Aultman-T....	30-60	4000	4	Own	4-7 x9	G,K,D	8-10
Automot...B-3	12-24	1250	4	Here.	4-4 x5½	Gas.	2-3
Avery,SR(Cul.	5-10	....	4	Own	4-3 x4	G,K	..
Avery (Gult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x8	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4¾x6	G,K,D	2-3
§Avery.....	....	....	*	Own	4-4x5½	G,K,D	3-4
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	2-3
Avery.....	14-28	....	4	Own	4-4½x7	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x8	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule,JH	15-25	....	4	Midw.	4-4½x5¼	Gas.	3
Bates Mule,JF	18-25	....	*2	Midw.	4-4½x5¼	Gas.	3
‡BatesMule(G	25-35	....	*2	Midw.	4-4½x6	Gas.	..
Bear.....	25-35	4250	*2	Ste.	4-4¾x6½	Gas.	4
‡Beeman Jr..	¾-1½	180	2	B&S	1-2½x2½	Gas.	..
‡Beeman...G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	30	....	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	....	*2	Own	4-6½x8½	G,K,D	8-9
‡Bolens.....	....	....	4	B&S	1-2½x2½	G.	..
Boring.....	5-10	395	4	LeR.	4-3½x4½	G.	..
Boring....1921	....	1850	3	Wauk	4-4½x5¾	GorK	2
**Bryan.....	15-30	....	4	Own	2-4 x5	K.	3
Case.....	12-20	1050	4	Own	4-4½x5	G,K,D	2-3
Case.....	15-27	1320	4	Own	4-4½x6	G,K,D	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	G,K,D	4-5
Case.....	40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar T35	15	....	*2	Own	4-4 x5½	Gas.	3
Caterpillar..5T	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar 10T	40	....	*2	Own	4-6½x7	Gas.	6
Centaur.....	5-2½	345	2	N Way	2-4½x4½	GorK	1
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1500	3	Dom,	4-4¾x6	Gas.	3
Do-It-All,Baby	1	237	..	Own	1-2¾x2¾	Gas.	1
Do-It-All.....A	2-6	495	..	Own	1-4½x5	Gas.	1
Do-It-All, Jack	6	395	..	Own	1-3⅝x3⅜	Gas.	1
Do-It-All....6	12	495	2	Own	2-3⅝x3⅜	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....H	16-30	....	4	Own	2-8 x8	GorK	4-5
E-B.....AA	12-20	1095	4	Own	4-4¼x5	G,K,D	3
Fageol.....D	9-18	1175	4	Lyc.	4-3½x5	Gas.	2
Farm Horse.B	18-30	1885	4	Clim	4-5 x6½	G,K	4
Fitch ..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	395	4	Own	4-4 x5	G,K	2
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt...A	18-36	$2150	4	Wauk.	4-4¾x6¾	GorK	4
Gray.....	20-36	1975	3	Wauk.	4-4½x6¼	Gas.	4
Gray.....	22-44	2165	3	Wauk.	4-5 x6¼	Gas.	4-5
Gt. WesternSt	20-30	1950	4	Beav.	4-4¼x6	K	4
Hart-Parr...20	20	865	4	Own	2-5¼x6½	K,D.	2
Hart-Parr....30	30	1045	4	Own	2-6½x7	K,D.	3
‡Hart-Parr....	....	1395	4	Own	6½x7	K,D.	..
Heider.....D	9-16	628	4	Wauk.	4-4¼x5¾	G,K	2
Heider.....C	12-20	725	4	Wauk.	4-4½x6¾	G,K.	3
Heider...Cul(	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light..4	12-25	985	4	Wauk.	4-4½x5¾	GorK	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas.	3
Indiana.....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International..	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5½x8	G,K,D	4
¶Kinkade....	1½-3	190	1	Own	1-3 x3	Gas.	..
La Cresse....	12-24	985	2	Own	2-6 x7	G,K	3
Lauson.....5	12-25	1295	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....21	15-30	1675	4	Beav.	4-4½x6	GorK	3-4
‡Lauson Road	15-30	2000	4	Beav.	4-4½x6	K	..
Leader.....B	12-18	685	4	Own	2-6 x6¼	G,K,D	2-3
Leader.....N	16-32	1725	4	Clim.	4-5 x6½	G,K.	3-4
‡Leader....GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Little Giant..B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant..A	26-35	3300	4	Own	4-5½x6	K	6
Lombard..1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard..1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	5-10
Marsh Car1922	2	210	2	Evin	1-2⅝x2½	Gas.	..
Minne...All-P	12-25	800	4	Own	4-4½x7	GorK	3
Minne. Gen.P	17-30	1600	4	Own	4-4¾x7	GorK	3-4
Minne. Mod.D	22-44	2650	4	Own	4-6 x7	GorK	5-6
MinneHeavyD	25-70	3850	4	Own	4-7½x9	GorK	8-9
Mohawk .1922	9-16	650	2	Light	4-3¼x4½	KorG	1-2
Moline Univ D	9-18	650	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	....	2	Own	4-3½x5	Gas.	2-3
‡Monarch....	20-30	3500	*2	Beav.	4-4¾x6	G,K,D	4
Motor Macult.	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	375	4	Own	2-3¾x4	Gas.	1
Nichols-Shep..	20-42	2650	4	Own	2-8 x10	GorK	3-6
Nichols-Shep..	25-50	3000	4	Own	2-9 x12	GorK	4-8
Nichols-Shep..	35-70	3650	4	Own	2-10½x14	GorK	8-12
Nilson Senior.	20-40	1975	5	Wauk.	4-5 x6¼	G,K	4
OilPull.....E	30-60	.....	4	Own	2-10x12	K,D	8-10
¶Oldsmar.....K	2½-5	$225	4	Own	1-5½x5½	Gas.	1
Pioneer.....G	18-36	....	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	....	4	Own	4-7 x8	Gas.	10
Reliable.....	10-20	390	4	Own	2-6 x7	Ker.	2
Russell.....	12-24	1500	4	Own	4-4¼x5¾	GorK	2-3
Russell.....	15-30	2200	4	Own	4-5x6½	GorK	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	GorK	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	GorK	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky....J	10-20	1250	4	Own	4-4¼x5¼	G,K,D	2
Sandusky....E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
¶Shelby.....	1	150	3	B & S	1-2½x2½	G	..
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk.	4-3¾x5½	GorK	2
Toro Cultivator	6	750	3	LeR.	4-3½x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR.	4-3½x4½	Gas.	2
Townsend.....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend.....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend.....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
TractionMotor	40-50	....	4	....	8-3½x5	Gas.	4-5
Traylor....TB	6-12	500	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar...10	25-40	3750	*2	Wauk.	4-5 x6¼	GorK	4
TwinCity.....	12-20	1200	4	Own	4-4¼x6	H,K	3
Twin City.....	20-35	2750	4	Own	4-5½x6¾	G,K	5-6
Twin City.....	40-65	4750	4	Own	4-7¾x9	G,K	8-10
Uncle SamC20	12-20	1295	4	Weid.	4-4 x5½	G	2-3
Uncle SamB19	20-30	1985	4	Beav.	4-4¾x6	GorK	3-4
Uncle SamD21	20-30	1895	4	Beav.	4-4¾x6	GorK	3-4
Utiliter....501	2½-4	295	4	Own	1-3½x4½	G	1
Utiliter...501A	2½-4	340	4	Own	1-3½x4½	G	1
Wallis.....K	15-25	....	4	Own	4-4¼x5¾	G,K	3
Waterloo....N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore21-22	12-25	1185	4	Wauk.	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2000	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin..E	16-30	1850	4	Clim.	4-5 x6½	GorK	3
Wisconsin...F	20-40	2050	4	Wauk.	4-5 x6¼	GorK	4
Wisconsin...H	22-40	2550	4	Clim.	4-5½x7	GorK	4-6
Yuba....12-20	12-20	2400	*2	Wauk.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4½x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5½x7	D	..

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. B & S—Briggs & Stratton. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. Ste.—Stearns. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. §Track Runner. ‡Industrial Tractor. ¶Garden Tractor. **Steam Tractor.

Specifications of Current Passenger Car Models

PRICES 2-Pass.	5-Pass.	7-Pass.	Sport	Coupe	Sedan	Wheel Base	Tires	Engine Make	Cylinders: Bore and Stroke	Rated Horse Power (N.A.C.C.)	NAME AND MODEL	Carbureter	Starting and Lighting	Ignition	Clutch: Type and Make	Gearset	Universal: Type and Make	Rear Axle Type and Make	Gear Ratios
.....	$4500c	$4500	.....	.....	$6500	136	33x5	Cont..	6-3⅝x5¼	31.51	Ambassador.....R	Strom..	West.....	Bosch.....	m-d B-L....	B-L.....	f Norwalk..	F Tim...	4.45
$1995c	1785	1850	$1885c	.....	2485	127	33x4½	H-S...	6-3½x5	29.40	American.....D-66	Strom..	G-D.....	A-K.....	s-p B&B...	B & B ..	m Hartford..	F Salis..	4.50
.....	1650	.....	.....	.....	.....	127	33x4	Own..	2–	.....	American.....Steamer	None ..	L-N.....	L-N.....	None.....	None ...	.....	Own..	1.75
.....	1195	.....	.....	$1450c	.....	114	32x4	Cont..	6-3½x4¼	23.44	Anderson...Aluminum 6	.....	West.....	West.....	s-p B&B...	.....	.....	Salis..	.....
{1495	1495	1595	{1595c	1995c	1995d	120	33x4	Cont..	6-3⅜x4½	27.34	Anderson.....Series 40	Rayfield.	Remy.....	Remy.....	s-p B&B...	Durston.	f Snead.....	¾F Salis..	4.50
{1785p	.....	.....	{1945c	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	2620	2645	.....	3625	3695	130	34x4½	Own..	8-3½x5	33.80	Apperson.....8-21-S	Johnson	Bijur.....	Remy.....	m-d Own....	Own....	m Sterling...	½F Own..	4.25
1575	1475	1545n	{1895n	2275	2345	121	32x4	Cont..	6-3⅜x4½	27.34	Auburn.....6-51	Strom...	Remy.....	Remy.....	s-p B&B...	G-L.....	m Universal..	F Salis..	4.75
.....	.....	.....	{1995n	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	1395	.....	.....	.....	1850d	118	32x4	Cont..	6-3½x4¼	23.44	Barley.....	.....	Delco ..	Delco....	s-p B&B...	Fuller...	f M&E.....	Col.....	.....
1800	1800	.....	.....	2400	2500	121	32x4	Cont..	6-3¼x4½	25.35	Bay State.....	Strom...	Delco....	Delco....	s-p B&B...	Warner..	m Spicer...	¾F Col...	4.67
2950	2950c	.....	.....	3950	3950	121	32x4	Buda.	4-3¾x5½	22.50	Biddle.....B1 & B5	Zenith..	G-D.....	Simms....	s-p Warner .	Warner..	m Spicer....	½F Std...	4.50
5000	5000	.....	.....	.....	7000	125	32x4½	Own..	4-4 x5½	25.60	Brewster.....91	Zenith..	USL.....	Bosch.....	c Own....	Own....	F Own.....	F Own..	3.92
865	885	725g	.....	1175	{1395	109	31x4	Own..	4-4⅛x4¾	18.23	Buick. 1923-34-5-6-7-38	Marvel..	Delco....	Delco....	m-d Own....	Own....	m Own.....	¾F Own..	4.66
.....	.....	.....	.....	.....	{1325	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1175	1195	975g	.....	1935	1985	118	33x4	Own..	6-3⅜x4½	27.34	Buick. 1923-41-4-5-47	Marvel..	Delco....	Delco....	m-d Own....	Own....	m Own.....	¾F Own..	4.60
.....	.....	1435	{1625a	1895	2195	124	34x4½	Own..	6-3⅜x4½	27.34	Buick. 1923-48-9-50-4-55	Marvel..	Delco....	Delco....	m-d Own....	Own....	m Own.....	¾F Own..	4.90
.....	.....	.....	{1675c	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3100	3150	3150	.....	{3875a	4100	132	33x5	Own..	8-3½x5½	31.25	Cadillac.....61	Own....	Delco....	Delco....	m-d Own....	Own....	m Spicer....	F Tim...	4.50
.....	.....	.....	.....	{3925d	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1750	1790	.....	.....	2480	2575	122	32x4½	Cont..	6-3⅜x4½	27.34	Case.....X	Rayfield.	Delco....	Delco....	m-d Own....	Own....	f Snead	½F Col...	5.25
.....	1990	2250	1950	2480	2975	129	34x4½	Cont..	6-3⅝x5¼	31.54	Case.....W	Rayfield.	Delco....	Delco....	m-d Own....	Own....	f Arvac.....	¾F Col...	4.45
1185	1185	.....	.....	1595	2295	117	32x4	Own..	6-3¼x4½	25.35	Chalmers.....1922	Strom...	A-L.....	Remy.....	m-d Own....	Own....	m Hardy.....	½F Adams	5.13
.....	.....	1345	.....	.....	.....	122	32x4	Own..	6-3¼x4½	25.35	Chalmers.....1922	Strom...	A-L.....	Remy.....	m-d Own....	Own....	m Hardy.....	½F Adams	5.13
1495	1495c	1645	1595a	1995c	{2295d	123	33x4	Own..	6-3½x5	29.40	Chandler.....Six	Rayfield.	Bosch.....	Bosch.....	s-p B&B...	Own....	f Own.....	F Own..	4.45
.....	.....	.....	.....	.....	{2375f	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
510	525	425g	.....	{ 840c	860	102	30x3½	Own..	4-3½x4	21.53	Chevrolet.....Superior	Zenith	A-L.....	Remy....	c Own....	Own....	m Own.....	½F Own..	3.66
.....	.....	.....	.....	680k	.....	.....	.....	.....	.....	.....	.....	Holley	.....	A-L.....	.....	.....	.....	.....	.....
1085	995	.....	1260	1295d	1495	112	32x4	Own..	6-3⅛x4½	22.50	Cleveland.....41	Strom...	Bosch.....	Bosch.....	s-p Own....	Own....	m Mech.....	¾F Own..	4.45
2685	.....	2685	2685c	3285b	{3285c	127¼	33x5	Nort..	8-3½x4½	39.20	Cole.....890	Johnson	Delco....	Delco....	c North...	North...	m Spicer....	F Col...	4.46
.....	.....	.....	.....	.....	{3685f	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1475	1475	.....	1475c	1925c	1995d	115	32x4	Cont..	6-3⅜x4½	27.34	Columbia.....Elite	Strom...	A-L.....	A-K.....	s-p B&B...	Durston.	m Spicer....	¾F Tim...	.....
995	985	.....	.....	.....	1395d	115	31x4	Cont..	6-3½x4¼	23.44	Columbia.....Light Six	Strom...	A-L.....	A-L.....	s-p B&B...	Durston.	m Spicer....	¾F Tim...	.....
.....	1985	3085f	.....	2985d	3085f	125	33x4½	Cont..	6-3½x5¼	29.40	Comet.....C-53	Strom...	Wagner..	Wagner..	s-p B&B...	Muncie..	m Arvac.....	¾F Col...	4.45
1395	1395	.....	{1195b	2065b	2165d	116	32x4	Falls.	6-3½x4¼	23.44	Courier.....	Till.....	Bijur.....	A-K.....	s-p B&B...	Muncie..	f Norwalk..	¾F Col...	5.00
.....	.....	.....	{1495c	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3000	3000	3000	.....	.....	4500	122½	32x4	Cont..	6-3⅝x5¼	31.54	Crawford.....22-6-60	Strom...	West.....	Bosch.....	m-d B-L....	B-L.....	Spicer.....	½F Tim...	.....
.....	.....	.....	3500	.....	.....	135	33x5	Cont..	6-3⅝x5¼	31.54	Crawford-Dagmar...6-60	Zenith..	West.....	Bosch.....	m-d B-L....	B-L.....	Spicer.....	½F Tim...	.....
.....	.....	.....	.....	.....	.....	142	33x5	Own..	8-3¾x5	45.00	Cunningham.....V	Strom...	Delco....	Delco....	m-d Own....	Own....	f Snead.....	F Tim...	4.23
4350b	4350c	4350	.....	5250	6000	132	33x5	Own..	8-3½x5¼	39.20	Daniels.....D-19	Zenith..	Delco....	Delco....	m-d Own....	Own....	m Spicer....	F Tim...	.....
.....	1295	.....	1495	1795	1795	114	31x4	Cont..	6-3⅛x4¼	23.44	Davis.....71	Strom...	Delco....	Delco....	s-p B&B...	Warner..	m Peters....	½F Tim...	5.10
1595	1595	.....	1695	2095	.....	120	32x4	Cont..	6-3⅛x4¼	27.34	Davis.....61-67	Strom...	Delco....	Delco....	s-p B&B...	Warner..	m Peters....	¾F Tim...	5.15
1175	1175	1295e	1245	1545	1595	112	32x4	H-S..	4-3½x5	19.60	Dixie Flyer.....H-S-70	Strom...	Dyneto...	Eisemann..	s-p B&B...	G-L.....	f Hardy.....	F Peru..	4.75
850	880	.....	.....	980h	1195d	114	32x4	Own..	4-3⅞x4½	24.03	Dodge Brothers.....	Stewart..	N.E.....	N.E.....	m-d Own....	Own....	m Own.....	½F Own..	4.16
3350g	3950c	3950	.....	4985c	5750f	132	33x5	Own..	6-4 x5	38.40	Dorris.....6-80	Strom...	West.....	Bosch.....	m-d Own....	Own....	m Spicer....	F Tim...	4.23
865	865	.....	{1015a	{1240	{1370	108	31x4	D-Ly.	4-3½x5	19.60	Dort.....19-14	Carter..	Bosch.....	Conn.....	m-d Detlaff..	Own....	m Mech.....	¾F Flint..	4.66
.....	.....	.....	{1015d	{1020k	{1070k	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
990	990	.....	.....	{1145	{1195	115	31x4	Falls..	6-3⅛x4¼	23.44	Dort.....25-20	Carter..	Bosch.....	Bosch.....	m-d Detlaff..	Own....	Mech.....	¾F Flint..	4.66
.....	.....	.....	.....	{1365	{1495	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1275	1275	.....	.....	1650	1975	104	30x3½	Own..	4-2⅝x4½	11.03	Driggs.....	Zenith..	Bosch.....	Bosch.....	s-p Hoos...	Mech..	m Spicer....	¾F Own..	4.75
6500	6500	6750	.....	7800	7800	134	33x6	Own..	8-2½x5	26.45	Duesenberg...Straight 8	Strom...	Delco....	Delco....	s-p Own....	Own....	f Own.....	½F Own..	4.81
3000	3200	.....	.....	3800	4000	124	32x4½	Own..	4-3⅛x5½	24.81	Du Pont.....A	Y&T.....	West.....	Eisemann..	m-d B-L....	B-L.....	m Spicer.....	Col.....	4.50
890	890	.....	.....	1365	1365	109	31x4	Cont..	4-3½x4¼	24.03	Durant.....A-22	Till.....	A-L.....	A-L.....	s-p Own....	Own....	m,f Spicer..	¾F Adams	4.30
1600	1650	.....	.....	2250	2400	123½	32x4½	Anst..	6-3½x4½	25.35	Durant.....B-22	Rayfield.	A-L.....	A-L.....	s-p Ansted..	Warner..	m,f Spicer..	½F Tim...	5.15
1485	1095	950g	.....	1395c	1795	112	32x4	Own..	4-3½x5¼	18.91	Earl.....40	Scoe....	A-L.....	Conn.....	s-p B&B...	Own....	f Own.....	½F Own..	3.66
1095	1095	.....	1095	1345	.....	118	33x4	Lyc..	4-3½x5	19.60	Elcar.....K-4	Strom...	Delco....	Delco....	s-p B&B...	Muncie..	m Peters....	¾F Salis..	4.50
1395	1395	.....	1395	1975	2065	118	33x4	Cont..	6-3⅜x4½	27.34	Elcar.....8-R	Strom...	Delco....	Delco....	m-d Warner .	Warner..	m Spicer....	¾F Salis..	4.50
1125e	1125	.....	1165	1695	1615	118	33x4	Falls..	6-3⅛x4¼	23.44	Elgin.....K-1	Strom...	West.....	Wagner..	s-p B&B...	Mech..	m Mech.....	¾F Col...	4.66
.....	1045	.....	.....	1145k	{1895	108½	32x4	Own..	4-3½x5	18.23	Essex.....	Own....	Bosch.....	Bosch.....	m-d Own....	Own....	m Spicer.....	½F Own..	4.66
.....	.....	.....	.....	.....	{1245k	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
269r	298s	235g	.....	530	{595	100	30x3½	Own..	4-3¾x4	22.50	Ford.....T	Own....	Own.....	Own.....	m-d Own....	Own....	m Own.....	½F Own..	3.63
.....	.....	.....	.....	.....	{725	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3900	3900	.....	.....	4900	4900	132	32x4½	Own..	6-3½x5	27.34	Fox.....7F	Zenith..	West.....	Bosch.....	m-d B-L....	B-L.....	Spicer.....	½F Tim...	4.45
1900	1950	1750g	.....	2750	2850	115	32x4	Own..	6-3¼x4	25.35	Franklin.....10	Own....	N.E.....	A-K.....	s-p B&B...	Own....	m Spicer....	½F Own..	4.75
895	895	.....	.....	1095k	1345d	112	32x4	Lyc..	4-3½x5	29.60	Gardner.....T-R & G	Carter..	West.....	West.....	s-p B&B...	Mech..	m Mech.....	¾F Flint..	4.80
1385	1385	.....	.....	1895	1945	116	32x4	Own..	6-3½x4½	23.44	Grant.....	Strom...	Bijur.....	A-K.....	s-p B&B...	Durston.	m Spicer....	¾F Col...	4.66
490	490	.....	.....	.....	760	100	30x3½	Own..	4-3⅝x4	21.03	Gray.....	Scoe....	West.....	West.....	m-d Own....	Detroit..	m Mech.....	½F Tim...	3.90
2475	2475c	.....	3250	.....	3475	120	32x4½	Weid.	4-3¾x5½	22.50	H.C.S.....Series 4	Strom...	Delco....	Delco....	m-d B-L....	B-L.....	m Spicer....	¾F Own..	.....
.....	.....	2650	.....	3450	3450	125	32x4½	Own..	4-4½x4½	27.23	Handley-Knight.....	Till.....	A-L.....	A-L.....	m-d Warner .	Warner..	m Spicer....	½F Tim...	4.90
.....	995	.....	.....	.....	.....	114	31x4	Cont..	6-3½x4¼	25.35	Hanson.....30	Marvel..	Delco....	Delco....	s-p B&B...	Detroit..	.....	¾F Tim...	.....
1595	1595	1795	.....	2475c	2585	121	32x4	Cont..	6-3⅜x4½	27.34	Hanson.....60	Marvel..	Delco....	Delco....	s-p B&B...	Detroit..	.....	¾F Tim...	.....
.....	1345	1345c	.....	1950	1950	115	32x4	H-S..	4-3½x5	19.60	Hatfield.....A-42	Zenith..	Dyneto...	Conn.....	s-p B&B...	G-L.....	m Spicer....	¾F Col...	4.66
2395	2395c	2395	.....	3095d	3395	132	33x5	Own..	6-3½x5 9/16	29.40	Haynes.....75	Strom...	L-N.....	King.....	s-p Warner .	Own....	m Universal..	¾F Own..	4.60
1545	1495	.....	{1895a	{2095b	{2395d	121	32x4½	Own..	6-3½x5	29.40	Haynes.....55	Rayfield.	L-N.....	King.....	s-p Warner .	Own....	m Universal..	½F Own..	4.11
.....	.....	.....	{1895d	{2135p	{2695p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	2500c	2500	.....	3300c	3600f	126	34x4½	Own..	6-3½x4¼	29.40	Holmes.....Series 4	Strom...	Dyneto...	Eisemann..	m-d B-L....	B-L.....	m Spicer.....	½F Tim...	4.90
.....	1525c	1575	.....	2570c	{1625k	126	34x4½	Own..	6-3½x5	29.40	Hudson.....Super 6	Own....	Bosch.....	Bosch.....	m-d Own....	Own....	m Spicer.....	½F Own..	4.45
.....	.....	.....	.....	.....	{2295	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1395	1395	.....	.....	.....	2295	120	32x4	Cont..	6-3⅜x4½	27 34	Huffman.....	Strom...	Dyneto...	Conn.....	s-p B&B...	Covert..	.....	F Salis..	.....
{1150	1150	.....	1250a	1635	1785	112	32x4	Own..	4-3½x5½	16.90	Hupmobile.....Series R	Strom...	West.....	A-K.....	m-d Own....	Own....	m Universal..	¾F Own..	4.87
{1025g	.....	.....	.....	{1335k	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	1485	1685c	.....	2985	2985	121	32x4½	Cont..	6-3¼x4½	25.35	Jackson.....638	Strom...	A-L.....	Remy.....	s-p B&B...	Covert..	f Snead.....	¾F Salis..	4.75
995b	995	.....	1095a	1445c	1465d	112	31x4	Own..	6-3½x5	25.35	Jewett.....Six	Strom...	Remy.....	A-K.....	m-d Long...	Warner..	m Mech.....	½F Tim...	4.45
1895	1795	.....	.....	2785	2485	120	32x4	Own..	6-3⅛x4¾	26.38	Jordan.....MX	Strom...	Delco....	Delco....	s-p Detroit..	Detroit..	m Spicer....	½F Tim...	4.42
.....	.....	.....	2150c	.....	.....	124	32x4	Own..	6-3⅛x4¾	26.38	Jordan.....H	Strom...	Delco....	Delco....	s-p Detroit..	Detroit..	m Universal..	½F Tim...	4.42
.....	985	.....	.....	.....	1450	111	32x3½	Gray..	4-3½x5	19.60	Kelsey.....4	Scoe....	Bosch.....	Bosch.....	f-d Own....	f-d Own..	.....	Own..	4.50
.....	985	.....	.....	.....	1450	111	32x3½	Gray..	4-3½x5	19.60	Kelsey.....4	Scoe ..	Bosch.....	Bosch.....	s-p B&B...	Detroit..	Snead.....	½F Std...	4.75
.....	1525	.....	.....	.....	2175	118	32x4	Walk'r	6-3⅛x4½	23.44	Kelsey.....6	Strom...	Bijur.....	Bosch.....	f-d Own....	f-d Own.	.....	Own..	.....
5000	5000	5250	.....	5000	6000	130	32x4½	Own..	8-3 x5¼	28.80	Kenworthy.....8-90	.....	.....	.....	.....	.....	.....	.....	.....
1795	1795	.....	1795c	2400	2550	120	32x4½	Own..	8-3 x5	28.80	King.....K	Ball&B .	West.....	A-K.....	s-p Detroit..	Own....	f Hardy.....	F Col...	4.08
.....	.....	.....	.....	1995	2550f	124	32x4½	Own..	8-3 x5	28.80	King.....K	Ball&B..	West.....	A-K.....	s-p Detroit..	Own....	f Hardy.....	F Col...	4.08
.....	1885	2385	2385c	2975c	3075	124	32x4½	Own..	6-3⅛x5½	26.38	Kissel.....45	Strom...	Remy.....	Remy.....	m-d Warner .	Warner..	m Spicer....	F Own..	3.92
1690	1690	1690	1890	2750	2890	121	33x4	Cont..	6-3⅝x4½	27.34	Kline Kar.....6-55-K	Rayfield.	Wagner..	Conn.....	s-p B&B...	G-L.....	f Snead.....	½F Std...	4.75

MISCELLANEOUS

a—2 Passenger, d—5 Passenger,
b—3 Passenger, e—6 Passenger,
c—4 Passenger, f—7 Passenger,
g—Chassis Price,
h—All Metal Type,
k—Soft Top Type,
n—Tire Size 32x4½,
p—Sport.
r—Price without starter and demountable rims. Price, complete, $364
s—Price without starter and demountable rims. Price, complete, $393.
Standard Phaetons.

ENGINE

Anst—Ansted
Cont—Continental
D.-Ly—Dort Lycoming
H-S—Herschell-Spillman
Lyc—Lycoming
Nort—Northway
Walk'r—Walker
Weid—Weidely

CARBURETOR

Ball & B—Ball & Ball
Till—Tillotson
Strom—Stromberg
Y & T—Yale & Towne

CLUTCH

f-d—Friction drive
c—Cone
m-d—Multiple disc
s-p—Single plate
B & B—Borg & Beck
B-L—Brown-Lipe
North—Northway

STARTING, LIGHTING IGNITION

A-L—Auto Lite
G-D—Gray & Davis
L-N—Leece Neville
N. E.—North East
West—Westinghouse

GEARSET

f-d—Friction Drive
B-L—Brown-Lipe
G-L—Grant-Lees
Mech—Mechanics
North—Northway

UNIVERSAL

f—fabric
m—metal
M &E—Merchant & Evans
Mech—Mechanics

REAR AXLE

F—Floating
½F—Semi-Floating
¾F—Three-Quarter Floating
Col—Columbia
Salis—Salisbury
Std—Standard
Tim—Timken

(Continued on page 56)

The Coachbilt

ANDERSON

ALUMINUM SIX

There were no squeaks and rattles in the fine old carriages Anderson used to build, and the same is true of Anderson Motor cars today.

Coach

$1450

Touring Car $1195
f. o. b. factory

Anderson Motor Company, Rock Hill, South Carolina

Specifications of Current Passenger Car Models

PRICES 2-Pass.	5-Pass.	7-Pass.	Sport	Coupe	Sedan	Wheel Base	Tires	Engine Make	Cylinders: Bore and Stroke	Rated Horse Power (N.A.C.C.)	NAME AND MODEL	Carbureter	Starting and Lighting	Ignition	Clutch: Type and Make	Gearset	Universal: Type and Make	Rear Axle: Type and Make	†Gear Ratios
$3985	$4090e	$4090	.....	$5500	$5500	132	33x5	Own..	8-3¼x5½	33.80	LaFayette	Johnson	Delco	Delco	m-d Own	Own	m Own	F Own	4.58
5500	5500	5500	.....	5500	5500	134	32x4½	Own..	6-3⅜x5½	33.75	Leach 999	Rayfield	Delco	Delco	m-d	Own	m,f	Tim	
1695	{1695	{1795	$2045d	2345c	{2545d	123	32x4½	Anst..	6-3¼x4½	25.35	Lexington 23	Rayfield	G-D	Conn	m-d Ansted	Warner	f Snead	¾F Own	5.10
	{1995	{2095			{2145d														
1575	1395	.....	1575	{2085	2245	117	32x4	Own..	6-3½x5	23.44	Liberty 10-D	Strom	Wagner	Wagner	s-p B&B	Detroit	m Spicer	½F Tim	4.80
				{1695k															
3800	3800c	3800	.....	4400d	4700d	136	33x5	Own..	8-3⅜x5	36.45	Lincoln	Strom	Delco	Delco	m-d Own	Own	m Spicer	F Tim	4.58
.....	7600e	7600	.....	10500	11000	142	35x5	Own..	6-4½x5½	48.60	Locomobile 48	Ball&B	West	Delco	m-d Own	Own	m Own	F Own	3.50
3385	3185c	3185	.....	3985	4385	136	32x4½	Own..	6-3¾x5½	33.75	Marmon 34	Strom	Delco	Delco	m-d Own	Own	m Spicer	¾F Own	3.75
885	885	.....	.....	{985	1335	109	31x4	Own..	4-3⅝x4½	21.03	Maxwell	Stewart	A-L	Simms	c Own	Own		¾F Own	4.56
				{1235															
6300	6300c	6300	.....	7500	7500	140	33x5	Own..	6-4½x6	48.60	McFarlan 1922	Rayfield	West	Splitdorf	s-p B&B	B-L	m Peters	F Tim	3.50
3950	3950e	3950e	.....	4850	5250	132	32x4½	Own..	4-3¾x6⅝	22.50	Mercer Series 5	Ball&B	West	Eisemann	m-d Own	Own	m Spicer	F Own	3.87
.....	3750	3750	.....	5000	5000	132	32x4½	Own..	6-3¾x5	33.75	Mercer 6	Strom		Eisemann				¾F	3.77
1895	1895	.....	.....	.....	.....	119	32x4	Cont..	6-3¼x4½	25.35	Merit	Strom	Delco	Delco	s-p B&B	Muncie	f Snead	F Col	4.60
1490b	1590	.....	1850c	2050c	2275d	120	32x4	Own..	6-3½x5	29.40	Mitchell F-50	Strom	Remy	Remy	s-p B&B	Own	m Own	F Own	4.42
.....	.....	1690	.....	.....	.....	127	32x4½	Own..	6-3½x5	29.40	Mitchell F-50	Strom	Remy	Remy	s-p B&B	Own	m Own	F Own	4.42
950	950	.....	.....	.....	.....	115	32x4½	Own..	4-3¼x4½	16.90	Monroe 1922-S-9	Zenith	A-L	Conn	m-d Own	Mech	m Universal	¾F Own	5.30
1295	1195	p1445d	1885c	1585c	1695	115	31x4	Cont..	6-3¼x4½	23.44	Moon 6-40	Strom	Delco	Delco	s-p B&B	Warner	m Spicer	½F Tim	4.80
1785	1785	1785	1885	2785	{2785 f	128	33x4½	Cont..	6-3⅝x4½	27.34	Moon 6-58	Strom	Delco	Delco		B&B	B-L	m Spicer	½F Tim	5.09
					{2485c														
1210	1240	.....	1395c	.....	2040d	121	33x4	Own..	6-3¼x5	25.35	Nash 691-96-97	Marvel	Delco	Delco	s-p B&B	Own	m Own	½F Own	4.50
.....	.....	1390	1645	1890c	2190f	127	34x4½	Own..	6-3¼x5	25.35	Nash 692-94-95	Marvel	Delco	Delco	s-p B&B	Own	m Own	½F Own	4.50
915	935	.....	.....	{1385b	{1545d	112	33x4	Own..	4-3⅜x5	18.23	Nash Four 41-4	Schebler	Delco	Delco	s-p B&B	Own	m Own	½F Own	4.88
				{1195k	{1275k														
2475b	2475c	{2375	.....	3250c	3825f	130	32x4½	Own..	6-3½x5¼	29.40	National BB	Rayfield	West	Delco	s-p B&B	B-L	m Arvac	F Col	4.08
		{3150		{3725c															
2500	2500c	2600c	.....	.....	3500d	128	32x4½	Cont..	6-3¼x4½	25.35	Noma 3C	Claudel	Delco	Delco	s-p B&B	Detroit	m Spicer	½F Tim	4.45
2500	2500	.....	.....	.....	5500	128	33x5	Bea..	6-3½x5¼	29.40	Noma 1D	Zenith	Delco	Delco	s-p B&B	Detroit	f Spicer	½F Tim	4.45
.....	1035	.....	.....	.....	.....	116	32x3½	Lyc..	4-3½x5	19.60	Norwalk 430-KS	Zenith	Dyneto	Delco	s-p B&B	G-L	m Universal	¾F Col	5.00
975	995	795g	1165c	{1445d	1545	115	32x4	Own..	6-2¹¹⁄₁₆x4¾	18.99	Oakland 6-44	Marvel	Remy	Remy	c Own	Muncie	m Mech	F Own	4.33
				{1185a															
3750c	3750	3850	3750c	4500c	4800f	134	33x5	Cont..	6-3⅝x5¼	31.54	Ogren 6 T D Luxe	Rayfield	Bosch	Bosch	m-d B-L	B-L	m	F Col	4.00
955	975	1350d	1075	1475	1595	115	32x4	Own..	4-3¹¹⁄₁₆x5¼	21.86	Oldsmobile 43 A	Zenith	A-L	Remy	s-p B&B	Warner	m Own	¾F Own	4.33
1735c	1850e	1735	.....	.....	.....	122	33x4½	Own..	8-2⅞x4¾	26.45	Oldsmobile 46	Ball&B	Delco	Delco	c Own	Warner	m Own	¾F Own	4.93
1625p	1375	.....	1675	1875	2025	115	32x4	Own..	8-2⅞x4½	26.45	Oldsmobile 47	Johnson	Delco	Delco	s-p B&B	Warner	m Spicer	¾F Own	5.10
525	525	.....	425g	795	875	100	30x3½	Own..	4-3⅜x4	18.23	Overland 4	Till	A-L	Conn	s-p B&B	Own	m Own	½F Own	4.50
2485	2485	2250g	.....	3175	3275	126	33x4½	Own..	6-3⅜x5	27.34	Packard Single-Six	Own	A-K	Delco	m-d Own	Own	f Spicer	½F Own	4.30
.....	2350g	2685	.....	.....	3525	133	33x4½	Own..	6-3⅜x5	27.34	Packard Single-Six	Own	A-K	Delco	m-d Own	Own	f Spicer	½F Own	4.66
3850	3850	3850	.....	5240	5400	136	35x5	Own..	12-3x 5	43.20	Packard Twin-Six	Own	Bijur	Delco	m-d Own	Own	m Spicer	½F Own	4.36
1465	1465	1290g	.....	1995	2245	119	32x4	Own..	6-3¼x5	25.35	Paige 6-44	Strom	Remy	A-K	s-p Long	Own	m Universal	¾F Salis	4.75
2495b	.....	2195	2245	3100	3155	131	33x4½	Cont..	6-3¾x5	33.75	Paige 6-66	Rayfield	Remy	A-K	s-p Long	Warner	m Mech	¾F Tim	4.60
.....	1390	1425	.....	2395	2395	120	32x4½	Cont..	6-3⅝x4½	27.34	Paterson 22-6-52	Strom	Delco	Delco	s-p B&B	Durston	m Hartford	½F Std	4.50
.....	2990c	2990	.....	{3300a	{3990d	128	33x5	Own..	8-3¼x5	33.80	Peerless 23	Ball&B	Delco	Delco	m-d Own	Own	M Spicer	¾F Tim	4.90
				{3400c	{4090f														
5250	5250c	5250	.....	6800	{6900	138	33x5	Own..	6-4 x5½	38.40	Pierce-Arrow	Own	Delco	Delco	m-d Own	Own	m Spicer	½F Own	3.93
					{700														
2050	2000	2050	.....	2950	3000	126	32x4½	H-S..	6-3¼x5	25.35	Pilot 6-50	Till	Bijur	Conn	s-p B&B	Muncie	m Hartford	¾F Col	4.33
3150	3100c	3250	.....	4300	5100	126¾	32x4½	Own..	6-3⅜x5½	27.34	Premier 6-D	Johnson	Delco	Delco	s-p B&B	Own	m Spicer	¾F	4.58
1095	1095	.....	.....	1750	1825	117	32x4	Falls..	6-3½x4½	23.44	Premocar 6-40-A	Strom	Wagner	Wagner	s-p B&B	Mech	m Spicer	¾F	4.66
.....	1665	.....	.....	2385	2475	116	32x4	Own..	4-3¾x5	22.50	R & V Knight R	Strom	Wagner	Wagner	s-p B&B	B-L	m Spicer	F Salis	4.75
2475	2475c	2475	.....	3015	3105	127	32x4½	Own..	6-3½x4½	29.40	R & V Knight J	Strom	Wagner	Wagner	s-p B&B	B-L	m Spicer	½F Tim	4.90
1595	1645	1485	1745	{2355c	{2435f	120	33x4	Own..	6-3¹⁄₁₆x5	24.34	Reo T6 & U6	Rayfield	N.E	N.E	m-d Own	Own	m,f Own	½F Own	4.70
				{1835	{1885														
3200	3200	3200	.....	.....	4000	131	32x4½	Dues..	4-4¼x6	28.90	ReVere C	Strom	West	Bosch	m-d B-L	B-L	m Spicer	¾F Std	4.00
.....	1485	.....	.....	1885	1985	117	32x4	Own..	6-3½x4¾	23.44	Rickenbacker A	Strom	Simms	A-K	c Own	Own	m Universal	¾F Own	.....
2685	2485c	2685	.....	3585	3585	128	32x4½	Cont..	6-3½x5¼	29.40	Roamer 6-54-E	Strom	Bijur	Bosch	s-p G-L	G-L	f Snead	½F Tim	4.88
3785	3485	3650c	3650c	.....	4650c	128	32x4½	Dues..	4-4¼x6	28.90	Roamer 4-75-E	Strom	Bijur	Splitdorf	m-d B-L	B-L	f Snead	½F Tim	3.77
.....	10900	.....	.....	.....	.....	143½	35x5	Own..	6-4½x4¾	48.60	Rolls-Royce	Own	Bijur	Bijur	c Own	Own	m Own	F Own	3.25
1195	1195	.....	.....	1795	1795	112	32x4	Own..	4-3½x5	19.60	Saxon 125	Strom	Wagner	Wagner	s-p Detlaff	Covert	m Peters	¾F	4.75
1645	1645	.....	.....	2645	2645	118	33x4	Cont..	6-3¼x4½	25.35	Sayers Six DP	Strom	Delco	Delco	s-p B&B	G-L	m Arvac	½F Std	4.75
875	875	.....	.....	.....	.....	108	30x3½	Lyc..	4-3½x5	19.60	Seneca L-2 & O-2	Zenith	A-L	A-L	s-p B&B	G-L	m Universal	F	4.75
1095	1095	.....	.....	.....	.....	112	31x4	Lyc..	4-3½x5	19.60	Seneca 50 & 51	Zenith	A-L	A-L	s-p B&B	G-L	Detroit	F	4.50
980	980	.....	.....	1685	1685	114	32x4	Supr.	4-3⅜x5	18.23	Sperling A	Zenith	Bijur	Splitdorf	s-p B&B	Warner	m Hartford	¾F Peru	.....
2150	.....	2395	2395	2750	3200	127	34x4½	Own..	8-3¼x5	33.80	Standard 98	Zenith	West	Splitdorf	s-p B&B	G-L	m Arvac	½F Tim	4.45
2750	2750	2750	2425g	3950c	3985f	130	32x4½	Own..	2-4 x5	.....	Stanley 740	None	Bijur	None	None	None	None	½F Own	1.50
1765	1765	.....	.....	2750	.....	118	33x4	Cont..	6-3¼x4½	25.35	Stanwood Six	Strom	West	A-K	s-p B&B	G-L	m Peters	½F Std	4.50
319r	348s	285g	.....	580	645	102	30x3½	Cont..	4-3¼x4½	15.63	Star	Till	A-L	A-L	s-p		Spicer	Tim	4.87
2250	2250	2450	.....	3150	3450	125	34x4½	Own..	4-3¾x5⅝	22.50	Stearns-Knight SKL4	Rayfield	West	A-K	m-d Own	Own	f Climax	½F Own	4.50
2700	2700	2850	.....	3500	3700	130	34x4½	Own..	6-3⅝x5	27.34	Stearns-Knight :6	Rayfield	West	A-K	m-d Own	Own	f Climax	½F Own	4.50
1575	1595c	1625c	.....	2450	2550	122	33x4½	Own..	6-3¼x4½	25.35	Stephens 90	Till	A-L	A-L	s-p B&B	Mech	m Mech	½F Tim	4.90
7250	6900c	6800	{6900c	8600	8900c	138	35x5	Own..	6-4 1/16x5½	47.27	Stevens-Duryea E	Strom	West	Berling	m-d Own	Own	a Own	F Own	3.94
			{5600g																
975	975	785g	.....	1225	1550	112	32x4	Own..	6-3¼x4½	23.44	Studebaker Light Six	Strom	Wagner	Wagner	s-p Own	Own	f Thermoid	½F Own	4.55
{1250	1275	1275c	1000g	1875	2050	119	32x4	Own..	6-3½x5	29.40	Studebaker Special Six	Strom	Wagner	Wagner	s-p Own	Own	m Spicer	½F Own	4.00
{1275c																			
1300g	1650	.....	1785	2275	2475	126	33x4½	Own..	6-3⅞x5	36.04	Studebaker Big Six	Ball&B	Wagner	Wagner	s-p Own	Own	m Spicer	½F Own	3.70
2450	{2790c	{2640e	2670a	3490	4450	130	32x4½	Own..	4-4⅜x6	30.63	Stutz KLDH	Strom	Remy	Delco	m-d Warner	Own	m Hartford	½F Own	3.50
	{3165c	{3015																	
2025	2125	2175c	.....	2650c	2785	118	32x4	Own..	4-3⅜x5½	18.23	Templar A-445	Strom	Bijur	Simms	s-p B&B	Detroit	f Snead	½F Us	4.40
1175	1175	.....	.....	.....	.....	117	33x4	H-S..	4-3½x5	19.60	Tulsa E-1-2-3	Zenith	Dyneto	Conn	s-p B&B	Muncie	m	F Salis	4.50
1275	1275	.....	1305	1795	1795	115	32x4	Own..	6-3¼x4½	23.44	Velie 58	Strom	West	A-K	s-p Dooley	Durston	m Thiemer	¾F Own	4.66
.....	1900f	1890	.....	.....	2890	125	32x4½	Cont..	6-3½x5¼	29.40	Westcott D-48	Rayfield	Delco	Delco	s-p B&B	B-L	m Peters	½F Tim	4.45
.....	1690	.....	1890	.....	2690	120	32x4	Cont..	6-3¼x4½	25.35	Westcott B-44	Rayfield	Delco	Delco	s-p B&B	Warner	m Peters	½F Col	4.33
2475	2475	.....	.....	3275	3475	121	32x4½	Own..	8-3¼x4	33.80	Wills Sainte Claire A-68	Zenith	Delco	Delco	m-d Own	Own	m Mech	¾F Own	4.45
1235	1235	1375	.....	1795	1950	118	32x4	Own..	4-3⅝x4½	21.03	Willys-Knight 20	Till	A-L	A-L	m-d Own	Own	f Own	¾F Own	4.44
3400	.....	3400	3600	4000	4550	132	33x5	Own..	6-3¾x5½	33.75	Winton 40	Rayfield	Delco	Delco	m-d Warner	Warner	f Climax	¾F Tim	4.68

MISCELLANEOUS
a—2 Passenger, d—5 Passenger
b—3 Passenger, e—6 Passenger,
c—4 Passenger, f—7 Passenger
g—Chassis Price,
h—All Metal Type,
k—Soft Top Type,
n—Tire Size 32x4½,
p—Sport.
r—Price without starter and demountable rims. Price, complete, $414.
s—Price without starter and demountable rims. Price, complete, $443.
†Standard Phaetone.

ENGINE
Anst—Ansted
Bea—Beaver
Cont—Continental
Dues—Duesenberg
H-S—Herschell-Spillman
Lyc—Lycoming
Supr—Supreme

CARBURETOR
Ball & B—Ball & Ball
Till—Tillotson
Strom—Stromberg

STARTING, LIGHTING IGNITION
A-L—Auto Lite
G-D—Gray & Davis
L-N—Leece Neville
N. E.—North East
West—Westinghouse

CLUTCH
c—Cone
f-d—Friction drive
m-d—Multiple disc
s-p—Single plate
B & B—Borg & Beck
B-L—Brown-Lipe

GEARSET
f-d—Friction Drive
B-L—Brown-Lipe
G-L—Grant-Lees
Mech—Mechanics

UNIVERSAL
f—fabric
m—metal
M&E—Merchant & Evans
Mech—Mechanics

REAR AXLE
F—Floating
½ Floating—Semi-Floating
¾ F—Three-Quarter Floating
Col—Columbia
Salis—Salisbury
Std—Standard
Tim—Timken